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XI. *Some Account of the Termites, which are found in Africa and other hot Climates. In a Letter from Mr. Henry Smeathman, of Clement's Inn, to Sir Joseph Banks, Bart.*  
*P. R. S.*

Read February 15, 1781.

S I R,

Clement's Inn,  
Jan. 23, 1781.

O F a great many curious parts of the creation I met with on my travels in that almost unknown district of Africa called Guinea, the TERMITES, which by most travellers have been called WHITE ANTS, seemed to me on many accounts most worthy of that exact and minute attention which I have bestowed upon them.

The amazingly great and sudden mischief they frequently do to the property of people in tropical climates, makes them well known and greatly feared by the inhabitants.

The size and figure of their buildings have attracted the notice of many travellers, and yet the world has not hitherto been furnished with a tolerable description of them, though their contrivance and execution scarce fall short of human ingenuity and prudence; but when we come to consider the wonderful oeconomy of these insects, with the good order of their subterraneous cities, they will appear foremost on the list of the wonders of the creation, as most closely imitating mankind in provident industry and regular government.

You had barely time to see and to admire some of their buildings in New Holland, and have been pleased to say, you think an accurate account of them would meet a favourable reception from the Royal Society. That which I now have the honour to present to you, is accurate and faithful as far as it goes. I have kept as close to my subject as was in my power, without being obscure, or falling short of my intention; and though I have given only the heads of what I could draw from my memorandums on the subject, they will probably be found sufficiently descriptive and historical for the bounds of a letter.

The sagacity of these little insects is so infinitely beyond that of any other animals I have ever heard of, that it is possible the accounts I have here communicated would not appear credible to many, without such vouchers and such corroborating testimony as I am fortunately able to produce, and are now before you. There are also many living witnesses in England to most of the extraordinary relations that I have given, so that I hope to have full credit for such remarks as no one but myself has probably had time and opportunities enough to make, and which are not susceptible of demonstration, except in those places where the insects are found.

Such as they are, I beg leave to lay them, with all diffidence and humility, before you and that illustrious Body of which you are President; and if they should in a small degree meet with approbation, I shall be exceedingly satisfied.

These insects are known by various names. They belong to the TERMES of LINNÆUS, and other systematical naturalists.

By the English, { In the windward parts of Africa they are called *Bugga Bugs*.  
In the West Indies, *Wood Lice*, *Wood Ants*, or *White Ants*.

By

At Senegal, *Vague-Vagues.*

By the French, { In the West Indies, *Pour de Bois*, or *Fourmis Blanches*.

By the Bolms, or Sherbro people, in Africa, *Scantz.*

By the Portuguese in the Brazils, *Coupée* or *Cutters*, from their cutting things in pieces.

By this latter name and that of *Piercers* or *Eaters*, and similar terms, they are distinguished in various parts of the tropical regions.

The following are the specific differences, given by Dr. SOLANDER, of such insects of this *genus* as I have observed and collected.

1. TERMES *bellicosus* corpore fusco, alis fuscescentibus: costâ ferrugineâ, stemmatibus subsuperis oculo propinquis, puncto centrali prominulo.
2. TERMES *mordax* nigricans, antennis pedibusque testaceis, alis fuliginosâ: areâ marginali dilatata: costâ nigrante, stemmatibus inferis oculo approximatis, puncto centrali impresso.
3. TERMES *atrox* nigricans, segmentis abdominalibus margine pallidis, antennis pedibusque testaceis, alis fuliginosâ: costâ nigrâ, stemmatibus inferis, puncto centrali impresso.
4. TERMES *destructor* nigricans, abdominis linea lateralî luteâ, antennis testaceis, alis hyalinis: costâ lutescente, stemmatibus subsuperis, puncto centrali obliterate.
5. TERMES *arborum* corpore testaceo, alis fuscescentibus: costâ lutescente, capite nigrante, stemmatibus inferis oculo approximatis, puncto centrali impresso.

The Termites are represented by LINNÆUS as the greatest plagues of both Indies, and are indeed every way between the

Tropics so deemed, from the vast damages they cause, and the losses which are experienced in consequence of their eating and perforating wooden buildings, utensils, and furniture, with all kinds of household-stuff and merchandize, which are totally destroyed by them, if not timely prevented; for nothing less hard than metal or stone can escape their most destructive jaws.

They have been taken notice of by various travellers in different parts of the torrid zone; and indeed where numerous, as is the case in all equinoctial countries and islands that are not fully cultivated, if a person has not been incited by curiosity to observe them, he must have been very fortunate who, after a short residence, has not been compelled to it for the safety of his property.

These insects have generally obtained the name of Ants, it may be presumed, from the similarity in their manner of living, which is, in large communities that erect very extraordinary nests, for the most part on the surface of the ground, from whence their excursions are made through subterraneous passages or covered galleries, which they build whenever necessity obliges, or plunder induces, them to march above ground, and at a great distance from their habitations carry on a business of depredation and destruction, scarce credible but to those who have seen it. But notwithstanding they live in communities, and are like the ants omnivorous; though like them at a certain period they are furnished with four wings, and emigrate or colonize at the same season; they are by no means the same kind of insects, nor does their form correspond with that of *Ants* in any one state of their existence, which, like most other insects, is changed several times.

The Termites resemble the Ants also in their provident and diligent labour, but surpass them as well as the Bees, Wasps,

Beavers, and all other animals which I have ever heard of, in the arts of building, as much as the Europeans excel the least cultivated savages. It is more than probable they excel them as much in sagacity and the arts of government; it is certain they shew more substantial instances of their ingenuity and industry than any other animals; and do in fact lay up vast magazines of provisions and other stores; a degree of prudence which has of late years been denied, perhaps without reason, to the Ants<sup>(1)</sup>.

Such however are the extraordinary circumstances attending their oeconomy and sagacity, that it is difficult to determine, whether they are more worthy of the attention of the curious and intelligent part of mankind on these accounts, or from the ruinous consequences of their depredations, which have deservedly procured them the name of *Fatalis* or *Destructor*.

As this is the case, it is a little surprising that an accurate natural history of these wonderful insects has not been attempted long since; especially as, according to BOSMAN (who wrote the beginning of this century) in his description of the Coast of Guinea, some curious circumstances relative to them must have been known. According to that gentleman, the King was supposed to be as large as a Cray-fish<sup>(2)</sup>. This, though a bad comparison, is pretty near the truth in respect to the size of the female, who is the *Common Mother* of the community;

(1) Though Ants have no occasion to lay up stores for winter in cold climates, they certainly must and do carry great quantities of provisions into their nests to feed the young brood; and most probably provide some before hand for fear of accidents, which might be fatal to the young ones, who, like all insects in the caterpillar state, are very voracious, and cannot bear disappointments of long duration.

(2) BOSMAN'S Guinea, p. 260.

and, according to the mode we have adopted from time immemorial in speaking of Ants and Bees, the QUEEN.

These communities consist of one *male* and one *female* (who are generally the *common parents* of the whole, or greater part, of the rest), and of three orders of insects, apparently of very different species, but really the same, which together compose great commonwealths, or rather monarchies, if I may be allowed the term.

The great LINNÆUS, having seen or heard of but two of these orders, has classified the genus erroneously; for he has placed it among the *Aptera*, or insects without wings; whereas the chief order, that is to say, the insect in its perfect state, having four wings without any sting, it belongs to the *Neuroptera*; in which class it will constitute a new genus of many species<sup>(3)</sup>.

The different species of this genus resemble each other in form, in their manner of living, and in their good and bad qualities: but differ as much as birds in the manner of building their habitations or nests, and in the choice of the materials of which they compose them.

There are some species which build upon the surface of the ground, or part above and part beneath, and one or two species, perhaps more, that build on the stems or branches of trees, sometimes aloft at a vast height.

(3) I have no doubt, from the account and figures given of the European *Termes Pulsatorius*, or Death Watch, by the illustrious BARON DE GEER, in his seventh volume of *Mémoires pour servir à l' Histoire des Insectes*, that in their perfect state they have wings, and swarm or emigrate, and live in a manner analogous to those of hot climates; for they seem to have quite the external form of the exotic *Termes*, that is to say, of the first and third order. DE GEER, *Mémoires*, tom. VII. p. 45. pl. IV. fig. 1, 2, 3, & 4.

Of every species there are three orders; first, the working insects, which, for brevity, I shall generally call *labourers*; next the fighting ones, or *soldiers*, which do no kind of labour; and, last of all, the winged ones, or *perfect insects*, which are male and female, and capable of propagation. These might very appositely be called the *nobility* or *gentry*, for they neither labour, or toil, or fight, being quite incapable of either, and almost of self-defence. These only are capable of being elected kings or queens; and nature has so ordered it, that they emigrate within a few weeks after they are elevated to this state, and either establish new kingdoms, or perish within a day or two.

The *Termes bellicosus* being the largest species is most remarkable and best known on the Coast of Africa. It erects immense buildings of well-tempered clay or earth, which are contrived and finished with such art and ingenuity, that we are at a loss to say, whether they are most to be admired on that account, or for their enormous magnitude and solidity. It is from the two lower orders of this, or a similar species, that LINNÆUS seems to have taken his description of the *Termes Fatalis*; and most of the accounts brought home from Africa or Asia of the white Ants are also taken from a species that are so much alike in external habit and size, and build so much in their manner, that one may almost venture to pronounce them mere variations of the same species.

The reason that the larger Termites have been most remarked is obvious; they not only build larger and more curious nests, but are also more numerous, and do infinitely more mischief to mankind. When these insects attack such things as we would not wish to have injured, we must consider them as most pernicious; but when they are employed in destroying decayed trees

and substances which only incumber the surface of the earth, they may be justly supposed very useful, and for the reason that they are in one sense most pernicious, they are in the other most useful. In this respect they resemble very much the common Flies, which are regarded by mankind in general as noxious, and at best as useless beings in the creation; but this is certainly for want of consideration. There are not probably in all nature animals of more importance, and it would not be difficult to prove, that we should feel the want of one or two species of large quadrupeds, much less than of one or two species of these despicable-looking insects. Mankind in general are sensible that nothing is more disagreeable, or more pestiferous, than putrid substances; and it is apparent to all who have made observation, that those little insects contribute more to the quick dissolution and dispersion of putrescent matter than any other. They are so necessary in all hot climates, that even in the open fields a dead animal or small putrid substance cannot be laid upon the ground two minutes before it will be covered with Flies and their Maggots, which instantly entering quickly devour one part, and perforating the rest in various directions, expose the whole to be much sooner dissipated by the elements. Thus it is with the Termites; the rapid vegetation in hot climates, of which no idea can be formed by any thing to be seen in this, is equalled by as great a degree of destruction from natural as well as accidental causes<sup>(4)</sup>. It seems apparent, that when any thing whatever is arrived at its last degree of perfection, the Creator has decreed it shall

(4) The Guinea grass, which is so well known and so much esteemed by our planters in the West Indies, grows in Africa thirteen feet high upon an average, which height it attains in about five or six months; and the growth of many other plants is as quick,

be totally destroyed as soon as possible, that the face of nature may be speedily adorned with fresh productions in the bloom of spring or the pride of summer: so when trees, and even woods, are in part destroyed by tornadoes or fire, it is wonderful to observe, how many agents are employed in hastening the total dissolution of the rest<sup>(5)</sup>; but in the hot climates there are none so expert, or who do their business so expeditiously and effectually, as these insects, who in a few weeks destroy and carry away the bodies of large trees, without leaving a particle behind, thus clearing the place for other vegetables, which soon fill up every vacancy; and in places, where two or three years before there has been a populous town, if the inhabitants, as is frequently the case, have chosen to abandon it, there shall be a very thick wood, and not the vestige of a post to be seen, unless the wood has been of a species which, from its hardness, is called *iron wood*.

My general account of the Termites is taken from observations made on the *Termes bellicosus*, to which I was induced by the greater facility and certainty with which they could be made.

The nests of this species are so numerous all over the island of Bananas, and the adjacent continent of Africa, that it is scarce possible to stand upon any open place, such as a rice plantation, or other clear spot, where one of these buildings is not to be seen within fifty paces, and frequently two or three are to be seen almost close to each other. In some parts near Senegal, as mentioned by Mons. ADANSON, their number, magnitude, and closeness of situation, make them appear like the villages of the natives<sup>(6)</sup>: and you have yourself seen them perhaps still more numerous, though not so large, in New Holland.

These

(5) See STILLINGFLEET's Tracts.

(6) " But of all the extraordinary things I observed, nothing struck me more than certain eminences, which, by their height and regularity, made me take

These buildings are usually termed hills, by natives as well as strangers, from their outward appearance, which is that of little hills more or less conical, generally pretty much in the form of sugar loaves, and about ten or twelve feet in perpendicular height above the common surface of the ground.<sup>(7)</sup> <sup>(8)</sup> <sup>(9)</sup>, tab. VII. fig. I.

### These

" them at a distance for an assemblage of negroes huts or a considerable village,  
" and yet they were only the nests of certain insects. They are round pyramids  
" from eight to ten feet high, upon nearly the same base, with a smooth surface  
" of rich clay, excessively hard and well built." ADANSON's Voyage to Senegal,  
8vo, p. 153—337. *Voyage de Senegal*, 4to, p. 83 and 99.

Note. What Mr. ADANSON says of the opening which gives ingress and regress is manifestly a mistake, arising from the natural conclusion that those insects had some way out and in to their nests, without examining where it was. It will appear by this account, that they have many thousand ways out and in, but all subterraneous.

(7) JOBBEN, in his History of Gambia, says, " The Ant hills are remarkable  
" cast up in those parts by Pismires, some of them twenty foot in height, of  
" compasse to contayne a dozen men, with the heat of the sun baked into that  
" hardnesse, that we used to hide ourselves in the ragged topes of them, when  
" we took up stands to shoot at deer or wild beasts." PURCHAS's Pilgrims, vol.  
II. p. 1570.

(8) " The Ants make nests of the earth about twice the height of a man."  
BOSMAN's Description of Guinea, p. 276—493.

(9) The labourers are not quite a quarter of an inch in length; however, for the sake of avoiding fractions, and of comparing them and their buildings with those of mankind more easily, I estimate their length or height so much, and the human standard of length or height, also to avoid fractions, at six feet; which is likewise above the height of men. If then one labourer is = to one-fourth of an inch = to six feet, four labourers are = to one inch in height = 24 feet, which multiplied by 12 inches, gives the comparative height of a foot of their building = 288 feet of the building of men, which multiplied by 10 feet, the supposed average height of one of their nests is = 2880 of our feet, which is 240 feet more than half a mile, or near five times the height of the great pyramid; and, as it

These hills continue quite bare until they are six or eight feet high ; but in time the dead barren clay, of which they are composed, becomes fertilized by the genial power of the elements in these prolific climates, and the addition of vegetable salts and other matters brought by the wind ; and in the second or third year, the hillock, if not over-shaded by trees, becomes, like the rest of the earth, almost covered with grass and other plants ; and in the dry season, when the herbage is burnt up by the rays of the sun, it is not much unlike a very large hay-cock.<sup>(10)</sup>.

Every one of these buildings consists of two distinct parts, the exterior and the interior.

The exterior is one large shell in the manner of a dome, large and strong enough to inclose and shelter the interior from the vicissitudes of the weather, and the inhabitants from the attacks of natural or accidental enemies. It is always, therefore, much stronger than the interior building, which is the habitable part divided with a wonderful kind of regularity and contrivance into an amazing number of apartments for the residence of the *king* and *queen*, and the nursing of their nu-

is proportionably wide at the base, a great many times its solid contents. If to this comparison we join that of the time in which the different buildings are erected, and consider the Termites as raising theirs in the course of three or four years, the immensity of their works sets the boasted magnitude of the antient wonders of the world in a most diminutive point of view, and gives a specimen of industry and enterprize as much beyond the pride and ambition of men as St. Paul's Cathedral exceeds an Indian hut.

(10) See a figure of one of those nests in SALMON's Universal Traveller, in the map of Gambia, where it is called a Pismire Hill : there is also a figure of one of the labouring insects ; but as the hill is represented below all proportion, and the insect rather larger than life, it gives no idea of the building. I have not been able to find out from what author SALMON took this figure ; and it is the only one I have met with.

merous progeny; or for magazines, which are always found well filled with stores and provisions.

I shall forbear at this time entering into a very minute account of the inside of these wonderful buildings, as the bare recital might appear tedious; though I flatter myself, that when I have an opportunity of communicating it to the publick at large, the readers will follow me through an exact description of them with pleasure.

These hills make their first appearance above ground by a little turret or two in the shape of sugar loaves, which are run a foot high or more<sup>(11)</sup>. Soon after, at some little distance, while the former are increasing in height and size, they raise others, and so go on increasing the number and widening them at the base, till their works below are covered with these turrets, which they always raise the highest and largest in the middle, and by filling up the intervals, between each turret, collect them as it were into one dome.

They are not very curious or exact about these turrets, except in making them very solid and strong, and when by the junction of them the dome is compleated, for which purpose the turrets answer as scaffolds, they take away the middle ones entirely, except the tops (which joined together make the crown of the cupola) and apply the clay to the building of the works within, or to erecting fresh turrets for the purpose of raising the hillock still higher; so that no doubt some part of the clay is used several times, like the boards and posts of a mason's scaffold.

(11) Some of these turrets are represented in the view of their hills, (tab. VII. fig. 3.). I have seen turrets on the sides of these nests four or five feet high (tab. VII. fig. 1. a. a. a.).

When these hills are at about little more than half their height, it is always the practice of the wild bulls to stand as centinels upon them, while the rest of the herd is ruminating below (tab. VII.). They are sufficiently strong for that purpose, and at their full height answer excellently as places to look out. I have been with four men on the top of one of these hillocks. Whenever word was brought us of a vessel in sight, we immediately ran to some Bugga Bug hill, as they are called, and clambered up to get a good view, for upon the common surface it was seldom possible to see over the grass or plants, which, in spite of monthly brushings, generally prevented all horizontal views at any distance.

The outward shell or dome is not only of use to protect and support the interior buildings from external violence and the heavy rains; but to collect and preserve a regular degree of genial warmth and moisture which seems very necessary for hatching the eggs and cherishing the young ones.

The *royal chamber*, which I call so on account of its being adapted for, and occupied by, the *king* and *queen*, appears to be in the opinion of this little people of the most consequence, being always situated as near the center of the interior building, as possible, and generally about the height of the common surface of the ground, at a pace or two from the hillock. It is always nearly in the shape of half an egg or an obtuse oval within, and may be supposed to represent a long oven (tab. VIII. fig. 1. and 2.).

In the infant state of the colony, it is not above an inch or thereabout in length; but in time will be increased to six or eight inches or more in the clear, being always in proportion to the size of the *queen*, who, increasing in bulk as in age, at length requires a chamber of such dimensions.

This singular part would bear a long description, which I shall not trouble you with at present, and only observe, that its floor is perfectly horizontal; and in large hillocks, sometimes an inch thick and upward of solid clay. The roof also, which is one solid and well-turned oval arch, is generally of about the same solidity, but in some places it is not a quarter of an inch thick, this is on the sides where it joins the floor (tab. VIII. fig. 1. a. a.), and where the doors or entrances are made level therewith at pretty equal distances from each other (tab. VIII. fig. 2. and 4. b. b.)

These entrances will not admit any animal larger than the soldiers or labourers, so that the *king*, and the *queen* (who is, at full size, a thousand times the weight of a *king*) can never possibly go out.

The royal chamber, if in a large hillock, is surrounded by an innumerable quantity of others of different sizes, shapes, and dimensions; but all of them arched in one way or another, sometimes circular, and sometimes elliptical or oval.

These either open into each other or communicate by passages as wide, and being always empty are evidently made for the soldiers and attendants, of whom it will soon appear great numbers are necessary, and of course always in waiting.

These apartments are joined by the magazines and nurseries. The former are chambers of clay, and are always well filled with provisions, which to the naked eye seem to consist of the raspings of wood and plants which the Termites destroy, but are found in the microscope to be principally the gums or inspissated juices of plants. These are thrown together in little masses, some of which are finer than others, and resemble the sugar about preserved fruits, others are like tears of gum, one

quite

quite transparent, another like amber, a third brown, and a fourth quite opaque, as we see often in parcels of ordinary gums.

These magazines are intermixed with the nurseries, which are buildings totally different from the rest of the apartments : for these are composed entirely of wooden materials, seemingly joined together with gums. I call them the nurseries because they are invariably occupied by the eggs, and young ones, which appear at first in the shape of labourers, but white as snow. These buildings are exceeding compact, and divided into many very small irregular-shaped chambers, not one of which is to be found of half an inch in width (tab. VIII. fig. 5.). They are placed all round the royal apartments, and as near as possible to them.

When the nest is in the infant state, the nurseries are close to the royal chamber ; but as in process of time the queen enlarges, it is necessary to enlarge the chamber for her accommodation ; and as she then lays a greater number of eggs, and requires a greater number of attendants, so it is necessary to enlarge and encrease the number of the adjacent apartments ; for which purpose the small nurseries which are first built are taken to pieces, rebuilt a little farther off a size bigger, and the number of them encreased at the same time.

Thus they continually enlarge their apartments, pull down, repair, or rebuild, according to their wants, with a degree of sagacity, regularity, and foresight, not even imitated by any other kind of animals or insects that I have yet heard of.

There is one remarkable circumstance attending the nurseries, which I must not at this time omit. They are always found slightly overgrown with mould (tab. VIII. fig. 6), and plentifully sprinkled with small white globules about the size of a small pin's head. These at first I took to be the eggs ; but,

on bringing them to the microscope, they evidently appeared to be a species of mushroom, in shape like our eatable mushroom in the young state in which it is pickled (tab. VIII. fig. 7.). They appear, when whole, white like snow a little thawed and then frozen again, and when bruised seem composed of an infinite number of pellucid particles, approaching to oval forms and difficult to separate ; the mouldiness seems likewise to be the same kind of substance<sup>(12)</sup>.

The nurseries are inclosed in chambers of clay, like those which contain the provisions, but much larger. In the early state of the nest they are not bigger than an hazel-nut, but in great hills are often as large as a child's head of a year old.

The disposition of the interior parts of these hills is pretty much alike, except when some insurmountable obstacle prevents ; for instance, when the *king* and *queen* have been first lodged near the foot of a rock or of a tree, they are certainly built out of the usual form, otherwise pretty nearly according to the following plan.

The royal chamber is situated at about a level with the surface of the ground, at an equal distance from all the sides of the building, and directly under the apex of the hill (tab. VII. fig. 2. A. A.).

(12) MR KONIG, who has examined these kind of nests in the East Indies, in an Essay upon the Termites, read before the Society of Naturalists of Berlin, conjectures, that these mushrooms are the food of the young insects. This supposition implies, that the old ones have a method of providing for and promoting their growth ; a circumstance which, however strange to those unacquainted with the sagacity of these Insects, I will venture to say, from many other extraordinary facts I have seen of them, is not very improbable.

N. B. MR. KONIG has not discovered the magazines of provisions in the nests which he opened, as far as I am informed ; but I must observe here, that what I have learned of this gentleman's account was from an extempore translation of the heads of it.

It is on all sides, both above and below, surrounded by what I should call the *royal apartments*, which have only labourers and soldiers in them, and can be intended for no other purpose than for these to wait in, either to guard or serve their common FATHER and MOTHER, on whose safety depends the happiness, and, according to the negroes, even the existence of the whole community.

These apartments compose an intricate labyrinth, which extends a foot or more in diameter from the *royal chamber* on every side. Here the nurseries and magazines of provisions begin, and, being separated by small empty chambers and galleries, which go round them or communicate from one to the other, are continued on all sides to the outward shell, and reach up within it two-thirds or three-fourths of its height, leaving an open area in the middle under the dome, which very much resembles the nave of an old cathedral: this is surrounded by three or four very large Gothic-shaped arches, which are sometimes two or three feet high next the front of the area, but diminish very rapidly as they recede from thence like the arches of aisles in perspectives, and are soon lost among the innumerable chambers and nurseries behind them.

All these chambers, and the passages leading to and from them, being arched, they help to support one another; and while the interior large arches prevent them falling into the center, and keep the area open, the exterior building supports them on the outside.

There are, comparatively speaking, few openings into the great area, and they for the most part seem intended only to admit that genial warmth into the nurseries which the dome collects.

The interior building or assemblage of nurseries, chambers, &c. has a flattish top or roof without any perforation, which would keep the apartments below dry, in case through accident the dome should receive any injury and let in water; and it is never exactly flat and uniform; because they are always adding to it by building more chambers and nurseries: so that the divisions or columns between the future arched apartments resemble the pinnacles upon the fronts of some old buildings, and demand particular notice as affording one proof that for the most part the insects project their arches, and do not make them, as I imagined for a long time, by excavation (tab. VII. fig. 2. b.).

The area has also a flattish floor, which lays over the royal chamber, but sometimes a good height above it, having nurseries and magazines between (tab. VII. fig. 2. c.). It is likewise water-proof, and contrived, as far as I could guess, to let the water off, if it should get in, and run over by some short way into the subterraneous passages which run under the lowest apartments in the hill in various directions, and are of an astonishing size, being wider than the bore of a great cannon. I have a memorandum of one I measured, perfectly cylindrical, and thirteen inches in diameter (tab. VII. fig. 2. d. d.).

These subterraneous passages or galleries are lined very thick with the same kind of clay of which the hill is composed, and ascend the inside of the outward shell in a spiral manner, and winding round the whole building up to the top intersect each other at different heights, opening either immediately into the dome in various places, and into the interior building, the new turrets, &c. or communicating thereto by other galleries of different bores or diameters, either circular or oval.

From every part of these large galleries are various small pipes or galleries leading to different parts of the building.

Under

Under ground there are a great many which lead downward by sloping descents three and four feet perpendicular among the gravel, from whence the labouring Termites cull the finer parts, which, being worked up in their mouths to the consistence of mortar, becomes that solid clay or stone of which their hills and all their buildings, except their nurseries, are composed.

Other galleries again ascend and lead out horizontally on every side, and are carried under ground near to the surface a vast distance: for if you destroy all the nests within one hundred yards of your house, the inhabitants of those which are left unmolested farther off will nevertheless carry on their subterraneous galleries, and invade the goods and merchandizes contained in it by sap and mine, and do great mischief, if you are not very circumspect.

But to return to the cities from whence these extraordinary expeditions and operations originate, it seems there is a degree of necessity for the galleries under the hills being thus large, being the great thoroughfares for all the labourers and soldiers going forth or returning upon any business whatever, whether fetching clay, wood, water, or provisions; and they are certainly well calculated for the purposes to which they are applied, by the spiral slope which is given them; for if they were perpendicular the labourers would not be able to carry on their building with so much facility, as they ascend a perpendicular with great difficulty, and the soldiers can scarce do it at all. It is on this account that sometimes a road like a ledge is made on the perpendicular side of any part of the building within their hill, which is flat on the upper surface, and half an inch wide, and ascends gradually like a stair-case, or like those roads which are cut on the sides of hills and mountains, that would otherwise

wife.

wife be inaccessible : by which, and similar contrivances, they travel with great facility to every interior part.

This too is probably the cause of their building a kind of bridge of one vast arch, which answers the purpose of a flight of stairs from the floor of the area to some opening on the side of one of the columns which support the great arches, which must shorten the distance exceedingly to those labourers who have the eggs to carry from the royal chamber to some of the upper nurseries, which in some hills would be four or five feet in the straightest line, and much more if carried through all the winding passages which lead through the inner chambers and apartments.

I have a memorandum of one of these bridges, half an inch broad, a quarter of an inch thick, and ten inches long, making the side of an elliptic arch of proportionable size ; so that it is wonderful it did not fall over or break by its own weight before they got it joined to the side of the column above. It was strengthened by a small arch at the bottom, and had a hollow or groove all the length of the upper surface, either made purposely for the inhabitants to travel over with more safety, or else, which is not improbable, worn so by frequent treading (tab. VII. fig. 2. E. E.).

Thus I have described, as briefly as the subject would admit, and I trust without exaggeration, those wonderful buildings whose size and external form have often been mentioned by travellers, but whose interior and more curious parts are so little known, that I may venture to consider my account of them as new, which is the only merit it has : for they are constructed upon so different a plan from any thing else upon the earth, and so complicated, that I cannot find words equal to

the task, and must therefore refer to the different figures, which, however extraordinary, scarce do justice to the subjects.

The nests before described are so remarkable on account of their size, that travellers have seldom, where they were to be seen, taken notice of any other; and have generally, when speaking of white Ants, described them as inhabitants of those hills. Those, however, which are built by the smaller species of those insects, are very numerous, and some of them exceedingly worth our attention; one sort in particular, which from their form I have named turret nests. These are a great deal less than the foregoing, and indeed much less in proportion to the size of the builders; but their external form is more curious, and their solidity considered they are prodigious buildings for so small an animal<sup>(13)</sup>.

These buildings are upright cylinders composed of a well-tempered black earth or clay, about three quarters of a yard high, and covered with a roof of the same material in the shape of a cone, whose base extends over and hangs down three or four inches wider than the perpendicular sides of the cylinder, so that most of them resemble in shape the body of a round wind-mill; but some of the roofs have so little elevation in the middle, that they are pretty much in the shape of the top of a full-grown mushroom (tab. IX. fig. 1.)

After one of these turrets is finished, it is not altered or enlarged; but when no longer capable of containing the community, the foundation of another is laid within a few inches of it. Sometimes, though but rarely, the second is begun before the first is finished, and a third before they have completed the

(13) If their height is estimated and computed by the size of the builders, and compared with ours upon the like scale; each of them is four or five times the height of the monument, and a great many times its solid contents.

second: thus they will run up five or six of these turrets at the foot of a tree in the thick woods, and make a most singular group of buildings (tab. IX.).

The turrets are so strongly built, that in case of violence they will much sooner overset from the foundation, and tear up the gravel and solid earth, than break in the middle; and in that case the insects will frequently begin another turret and build it, as it were, through that which is fallen; for they will connect the cylinder below with the ground, and run up a new turret from its upper side, so that it will seem to rest upon the horizontal cylinder only (tab. IX. fig. 5.).

I have not observed any thing else about these nests that is remarkable, except the quality of the black brown clay, which is as dark coloured as rich vegetable mould, but burns to an exceeding fine and clear red brick. Within, the whole building is pretty equally divided into innumerable cells of irregular shapes; sometimes they are quadrangular or cubic, and sometimes pentagonal; but often the angles are so ill defined, that each half of a cell will be shaped like the inside of that shell which is called the Sea-ear.

Each cell has two or more entrances, and as there are no pipes or galleries, no variety of apartments, no well-turned arches, wooden nurseries, &c. &c. they do not by any means excite our admiration so much as the hill nests, which are indeed collections of wonders.

There are two sizes of these turret nests, built by two different species of Termites. The larger species, the *Termes atrox*, in its perfect state measures one inch and three-tenths from the extremities of the wings on the one side to the extremities on the other (tab. X. fig. 14.). The lesser species, *Termes mordax*, measures

measures only eight-tenths of an inch from tip to tip (tab. X. fig. 10.

The next kind of nests, built by another species of this genus, the *Termes arborum*, have very little resemblance to the former in shape or substance. These are generally spherical or oval, and built in trees<sup>(14)</sup>. Sometimes they are seated between the arms and the stems of trees, and very frequently may be seen surrounding the branch of a tree at the height of seventy or eighty feet; and (though but rarely of so large a size) as big as a very great sugar cask<sup>(15)</sup><sup>(16)</sup>.

They are composed of small particles of wood and the various gums and juices of trees, combined with, perhaps, those of the animals, and worked by those little industrious creatures into a paste, and so moulded into innumerable little cells of very different and irregular forms, which afford no amusing variety and nothing curieus, but the immense quantity of inhabitants, young and old, with which they are at all times crowded; on which account they are sought for in order to feed young fowls, and especially for the rearing of Turkies. These nests are very compact, and so strongly attached to the boughs on which they are fixed, that there is no detaching them but by cutting them in pieces, or sawing off the branch; and they will sustain the force of a tornado as long as the tree on which they are fixed.

(14) The colour of these nests, like that of the roofed turrets, is black, from which, and their irregular surface and orbicular shape, they have been called *Negro Heads* by our first writers on the Carribbee Islands, and by the French, *Têtes des Noirs*. See HUNTER'S EVELYN'S SILVA, p. 17.

I have never been able to discover what author Mr. EVELYN alludes to in this mention of the Negro Heads.

(15) LONG's Jamaica, vol. III. p. 887.

(16) SLOANE's Jamaica, vol. II. p. 221. and sequel.

This species has the external habit, size, and almost the colour, of the *Termes atrox* (tab. X. fig. 21.).

There are some nests built in those sandy plains which we call, after the Spaniards, *Savannas*, that resemble the hill nests first described. They are composed of a black mud, which is brought from a few inches below the white sand, and are built in the form of an imperfect cone, or bell-shaped, having their tops rounded. These nests are generally about four or five feet high<sup>(17)</sup>. As I saw these only in passing through various Savannahs upon other pursuits, I can say very little of their interior parts. They seemed to be inhabited by nearly as large insects, differing very little except in colour, which is lighter than that of the *Termites bellicosus*.

Having given some idea of the nests, I shall beg your patient reading of a more particular account of the insects themselves, which will be exceeding necessary to a tolerable acquaintance with their oeconomy and management, their manner of building, fighting, and marching, and to a more particular account of their uses in the creation, and of the vast mischief they cause to mankind.

(17) "The nests of Ants are about four feet wide at the base, and two high, of an hemispherical form. Though made in loose sand, they are so hard as not to be broken without great efforts; and a laden cart could not break through.—In October and November they add a new story.—The Cochons-de Terre (the Last Ant-eater of Mr. PENNANT) make holes in these nests eight inches in diameter and six deep; and having destroyed the inhabitants, the nest is abandoned; but sometimes the Ants repair it." This last paragraph seems rather founded on conjecture. Voyage au Cap. par M. L'Abbé DE LA CAILLE, p. 305—356.

OVIEDO also says Ants make hillocks as high as a man.

Among these you will find, I must confess, some very extraordinary relations, and many that do not admit a possibility of demonstration ; such is the description of the form of an army of the *Termites viarum* marching, and the account of the regularity used by the *Termites bellicosus* in repairing a breach in their hills. But the very singular facts, of which you have the proofs before you, are sufficient I should conceive to procure me belief for the others. Should any person doubt, I would wish them to consider, that a student of nature and nature's laws, in any matter relating thereto, has no temptation to transgress the bounds of truth. I am very sensible, that the works of the creation, and the order thereof, are established in the highest wisdom ; that it is as absurd to attempt to exaggerate as to detract from them ; and can only serve to expose the ignorance of him who attempts it. Besides, what I have here advanced must be confirmed or contradicted in two or three years, since it will doubtless be examined into by all the curious who visit tropical regions.

I have observed before, that there are of every species of *Termites* three orders ; of these orders the working insects or labourers are always the most numerous ; in the *Termites bellicosus* there seems to be at the least one hundred labourers to one of the fighting insects or soldiers. They are in this state about one-fourth of an inch long, and twenty-five of them weigh about a grain ; so that they are not so large as some of our ants (tab. X. fig. 6.). From their external habit and fondness for wood, they have been very expressively called *Wood Lice* by some people, and the whole genus has been known by that name, particularly among the French. They resemble them, it is true, very much at a distance, but they run as fast or faster than any

other insects of their size, and are incessantly bustling about their affairs (18).

The second order, or soldiers, have a very different form from the labourers, and have been by some authors supposed to be the males, and the former neuters ; but they are, in fact, the same insects as the foregoing, only they have undergone a change of form, and approached one degree nearer to the perfect state. They are now much larger, being half an inch long, and equal in bulk to fifteen of the labourers (tab. X. fig. 8).

There is now likewise a most remarkable circumstance in the form of the head and mouth ; for in the former state the mouth is evidently calculated for gnawing and holding bodies ; but in this state, the jaws being shaped just like two very sharp awls a little jagged (tab. X. fig 9.), they are incapable of any thing but piercing or wounding, for which purposes they are very effectual, being as hard as a crab's claw, and placed in a strong horny head, which is of a nut-brown colour, and larger than all the rest of the body together, which seems to labour under great difficulty in carrying it : on which account perhaps the animal is incapable of climbing up perpendicular surfaces.

The third order, or the insect in its perfect state, varies its form still more than ever. The head, thorax, and abdomen, differ almost entirely from the same parts in the labourers and soldiers ; and, besides this, the animal is now furnished with four fine large brownish, transparent, wings, with which it is at the time of emigration to wing its way in search of a new settle-

(18) ROCHFORT, in the History of the Carribee Islands, calls them Wood Lice, and mentions the destruction they make, &c. p. 149.

ment (19).

ment<sup>(19)</sup>. In short, it differs so much from its form and appearance in the other two states, that it has never been supposed to be the same animal, but by those who have seen it in the same nest; and some of these have distrusted the evidence of their senses. It was so long before I met with them in the nests myself, that I doubted the information which was given me by the natives, that they belonged to the same family (tab. X. fig. r.) Indeed we may open twenty nests without finding one winged one, for those are to be found only just before the commencement of the rainy season, when they undergo the last change, which is preparative to their colonization. Add to this, they sometimes abandon an outward part of their building, the community being diminished by some accident to me unknown. Sometimes too different species of the real Ant (*Formica*) possess themselves by force of a lodgement, and so are frequently dislodged from the same nest, and taken for the same kind of insects. This I know is often the case with the nests of the smaller species, which are frequently totally abandoned by the Termites, and completely inhabited by different species of Ants, Cockroaches, *Scolopendræ*, Scorpions, and other vermin, fond of obscure retreats, that occupy different parts of their roomy buildings, which clearly accounts for your having met with the real Ants in those nests in New Holland.

(19) "There is a sort that frequently flies, having red wings.—This flying sort flings up the largest hills, and is wonderfully nimble and industrious." KOLBEIN'S Cape of Good Hope, 8vo, vol. II. p. 173.

DAPPER calls the Wood Ants *Acolalan*, and says it becomes as big as one's thumb, and then takes wing. Description de l'Afrique, folio, p. 459.

In the winged state they have also much altered their size as well as form. Their bodies now measure between six and seven tenths of an inch in length, and their wings above two inches and a half from tip to tip, and they are equal in bulk to about thirty labourers, or two soldiers. They are now also furnished with two large eyes placed on each side of the head, and very conspicuous; if they have any before, they are not easily to be distinguished. Probably in the two first states, their eyes, if they have any, may be small like those of moles; for as they live like these animals always underground, they have as little occasion for these organs, and it is not to be wondered at that we do not discover them; but the case is much altered when they arrive at the winged state in which they are to roam, though but for a few hours, through the wide air, and explore new and distant regions. In this form the animal comes abroad during or soon after the first tornado, which at the latter end of the dry season proclaims the approach of the ensuing rains, and seldom waits for a second or third shower, if the first, as is generally the case, happens in the night, and brings much wet after it<sup>(20)</sup>.

The quantities that are to be found the next morning all over the surface of the earth, but particularly on the waters, is astonishing; for their wings are only calculated to carry them

(20) "At night I visited Mr. HARRISON on board the sloop; during the time we had a dreadful tornado, in which a sort of large flies with long wings came on board in such prodigious numbers, that flying into the flames of the candles, the table was soon covered with those that burnt their wings; and others, which were not burnt; as they walked along the table shed their wings, and then were nothing but so many perfect large maggots." June 10, 1732.  
MOOR's Travels, p. 118.

a few hours, and after the rising of the sun not one in a thousand is to be found with four wings, unless the morning continues rainy, when here and there a solitary being is seen winging its way from one place to another, as if solicitous only to avoid its numerous enemies, particularly various species of Ants which are hunting on every spray, on every leaf, and in every possible place, for this unhappy race, of which probably not a pair in many millions get into a place of safety, fulfil the first law of nature, and lay the foundation of a new community.

Not only all kinds of ants, birds, and carnivorous reptiles, as well as insects, are upon the hunt for them, but the inhabitants of many countries, and particularly of that part of Africa where I was, eat them<sup>(21) (22) (23) (24) (25)</sup>.

On

(21) Mr. KONIG, in an Essay upon these Insects, read before the Society of Naturalists of Berlin, says, That, in some parts of the East Indies, the queens are given alive to old men for strengthening the back, and that the natives have a method of catching the winged insects, which he calls females, before the time of emigration. They make two holes in the nest; the one to windward, and the other to leeward. At the leeward opening they place the mouth of a pot, previously rubbed within with an aromatic herb called *Bergera*, which is more valued there than the laurel in Europe. On the windward side they make a fire of stinking materials, which not only drives these insects into the pots, but frequently the hooded snakes also, on which account they are obliged to be cautious in removing them. By this method they catch great quantities, of which they make with flour a variety of pastry, which they can afford to sell very cheap to the poorer ranks of people. Mr. KONIG adds, that in seasons when this kind of food is very plentiful, the too great use of it brings on an epidemic colic and dysentery, which kills in two or three hours.

I have

On the following morning, however, as I have observed, they are to be seen running upon the ground in chace of each other

I have not found the Africans so ingenious in procuring or dressing them. They are content with a very small part of those which, at the time of swarming, or rather of emigration, fall into the neighbouring waters, which they skin off with calabashes, bring large kettles full of them to their habitations, and parch them in iron pots over a gentle fire, stirring them about as is usually done in roasting coffee. In that state, without sauce or any other addition, they serve them as delicious food; and they put them by hands-full into their mouths, as we do comforts. I have eat them dressed this way several times, and think them both delicate, nourishing, and wholesome; they are something sweeter, but not so fat and cloying as the caterpillar or maggot of the *Palm-tree Snout-beetle*, *Curculio Palmarum*, which is served up at all the luxurious tables of West Indian epicures, particularly of the French, as the greatest dainty of the Western world.

According to the Baron DE GEER, Mr. SPARRMAN says, that the Hottentots eat these insects, and even grow fat upon them; but does not say what methods they take to procure or dress them. DE GEER, *Mémoires des Insectes*, tom. VII. p. 49.

(22) PISO, DE LAET, MARCGRAVE, and other writers, mention their being an article of diet in different parts of South America.

“ Alia præterea datur grandis species *Tama-ioura* dicta digitii articulum adæ-  
“ quans. Quarum etiam clunes desscantur et friguntur pro bono alimento.”  
PISO, Hist. Natural. lib. I. p. 9. lib. V. 291.

(23) MARCGR. Hist. Nat. 56.

(24) “ Denique formicæ hic visuntur grandissimæ, quas indigenæ vulgo come-  
“ dunt; et in foris venales habent.” DE LAET. Americæ Utriusque Descriptio,  
F. 332.

“ Formicis vescebantur, easque studiose ad victimum educabant. Ibid. p. 379.”

(25) Sir HANS SLOANE says, the silk-cotton-tree worm is esteemed by the Indians and negroes beyond marrow. This worm is no more than a large maggot, being the Caterpillar of a large Capricorn Beetle, or Goat Chafer: the Larva of a pretty large Cerambix (the *Lamia Tribulus* of FABRICIUS) which is also brought from Africa, where I have eaten those worms roasted. This insect is most probably to be found in all countries where the silk-cotton-tree (*Bombax*) is indigenous. SLOANE'S Jamaica, vol. II. p. 193.

I have

other; sometimes with one or two wings still hanging to their bodies, which are not only useless, but seem rather cumbersome<sup>(26)</sup>.

The greater part have no wings, but they run exceeding fast, the males after the females; I have sometimes remarked two males after one female, contending with great eagerness who should win the prize, regardless of the innumerable dangers that surrounded them.

They are now become from one of the most active, industrious, and rapacious, from one of the most fierce and implacable little animals in the world, the most innocent, helpless, and cowardly; never making the least resistance to the smallest Ant. The Ants are to be seen on every side in infinite numbers, of various species and sizes, dragging these annual victims of the laws of nature to their different nests. It is wonderful that a pair should ever escape so many dangers, and get into a place of security. Some, however, are so fortunate; and being found by some of the labouring insects that are continually running about the surface of the ground under their covered galleries, which I shall shortly describe, are *elected KINGS and QUEENS* of new states; all those who are not so elected and preserved certainly perish, and most probably in the course of the following day. The manner in which these labourers protect the happy pair from their innumerable enemies, not only on the day of the

I have discoursed with several gentlemen upon the taste of the white Ants; and on comparing notes we have always agreed, that they are most delicious and delicate eating. One gentleman compared them to sugared marrow, another to sugared cream and a paste of sweet almonds.

(26) LIGON observed them, but does not know what they are. LIGON's Barbadoes, p. 63.

massacre of almost all their race, but for a long time after, will I hope justify me in the use of the term ELECTION. The little industrious creatures immediately enclose them in a small chamber of clay suitable to their size, into which at first they leave but one small entrance, large enough for themselves and the soldiers to go in and out, but much too little for either of the royal pair to make use of; and when necessity obliges them to make more entrances, they are never larger; so that, of course, the *voluntary subjects* charge themselves with the task of providing for the offspring of their sovereigns as well as to work and to fight for them until they shall have raised a progeny capable at least of dividing the task with them.

It is not until this time, probably, that they consummate their marriage, as I never saw a pair of them joined. The business of propagation, however, soon commences, and the labourers having constructed a small wooden nursery, as before described, carry the eggs and lodge them there as fast as they can obtain them from the *queen*.

About this time a most extraordinary change begins to take place in the *queen*, to which I know nothing similar, except in the *PULEX PENETRANS* of LINNÆUS, the JIGGER of the *West Indies*, and in the different species of *coccus*, COCHINEAL. The abdomen of this female begins gradually to extend and enlarge to such an enormous size, that an *old queen* will have it increased so as to be *fifteen hundred or two thousand times* the bulk of the rest of her body, and *twenty or thirty thousand times* the bulk of a labourer, as I have found by carefully weighing and computing the different states (tab. X. fig. 3.). The skin between the segments of the abdomen extends in every direction; and at last the segments are removed to half an inch

inch distance from each other, though at first the length of the whole abdomen is not half an inch. They preserve their dark brown colour, and the upper part of the abdomen is marked with a regular series of brown bars from the thorax to the posterior part of the abdomen, while the intervals between them are covered with a thin, delicate, transparent skin, and appear of a fine cream colour, a little shaded by the dark colour of the intestines and watery fluid seen here and there beneath. I conjecture the animal is upward of two years old when the abdomen is increased to three inches in length : I have sometimes found them of near twice that size. The abdomen is now of an irregular oblong shape, being contracted by the muscles of every segment, and is become one vast matrix full of eggs, which make long circumvolutions through an innumerable quantity of very minute vessels that circulate round the inside in a serpentine manner, which would exercise the ingenuity of a skilful anatomist to dissect and develope. This singular matrix is not more remarkable for its amazing extension and size than for its peristaltic motion, which resembles the undulating of waves, and continues incessantly without any apparent effort of the animal ; so that one part or other alternately is rising and sinking in perpetual succession, and the matrix seems never at rest<sup>(27)</sup>, but is always protruding eggs to the amount (as I have frequently counted in old queens) of sixty in a minute<sup>(28)</sup>, or eighty thousand and upward in one day of twenty-four hours<sup>(29)</sup>.

These

(27) " We may observe in a *queen*, distended with egg, a partition along the back, and a continued motion from one extreme to the other, much like that we find in silk-worms." Account of English Ants by GOULD, p. 22.

(28) I cannot positively assert, that the old queens yield eggs so plentifully at all

These eggs are instantly taken from her body by her attendants (of whom there always are, in the royal chamber and the galleries adjacent, a sufficient number in waiting) and carried to the nurseries, which in a great nest may some of them be four or five feet distant in a straight line, and consequently much farther by their winding galleries. Here, after they are hatched, the young are attended and provided with every thing necessary until they are able to shift for themselves, and take their share of the labours of the community. The foregoing, I flatter myself, is an accurate description and account of the *Termes bellicosus* or species that builds the large nests in its different states.

Those which build either the roofed turrets or the nests in the trees, seem in most instances to have a strong resemblance to them, both in their form and oeconomy, going through the same changes from the egg to the winged state. The *queens* also increase to a great size when compared with the labourers; but very short of those *queens* before described. The largest are from about an inch to an inch and a half long, and not much thicker than a common quill. There is the same kind of peristaltic motion in the abdomen, but in a much smaller de-

times, but the protruding them being the consequence of the peristaltic motion, it would seem involuntary on their parts, and the number, or nearly so, always indispensable: the astonishing multitudes of inhabitants found in their nests also countenance this opinion strongly.

(29) Since the reading of this paper, Mr. JOHN HUNTER, so celebrated for his great skill and experience in comparative anatomy, has dissected two young queens. He finds the abdomen contains two ovaria, in each of which are many hundred ova-ducts, and in each of these ova-ducts a vast many eggs; so that there seems no doubt of the fact, as the matrix of a full-grown queen must be calculated for the production and yielding of a prodigious number of eggs. He has also dissected the kings; The result of these dissections, with some further particulars, will be related in another paper.

gree;

gree; and, as the animal is incapable of moving from her place, the eggs no doubt are carried to the different cells by the labourers, and reared with a care similar to that which is practised in the larger nests.

It is remarkable of all these different species, that the working and the fighting insects never expose themselves to the open air; but either travel under ground, or within such trees and substances as they destroy, except, indeed, when they cannot proceed by their latent passages, and find it convenient or necessary to search for plunder above ground. In that case they make pipes of that material with which they build their nests. The larger sort use the red clay; the turret builders use the black clay; and those which build in the trees employ the same ligneous substances of which their nests are composed.<sup>(30) (31) (32)</sup>.

With

(30) " Small birds, fowls, Lizards, and other reptiles; search for them as the most delicious morsels; therefore they never go abroad but under their covered ways." DU TERTRE, quarto, vol. II. p. 345.

(31) " The earth hereabouts was all filled with a species of a white Ant, called Vag Vague, different from that which I have elsewhere described. This, instead of raising pyramids, continues buried under ground, and never makes itself known but by small cylindrical galleries of the thickness of a goose quill, which it erects against the several bodies it designs to attack. These galleries are formed of earth with infinite delicacy of workmanship. The Vag Vagues make use of them as of covert-ways, to work without being seen; and whatever they fasten themselves to, whether it be leather, cloth, linen, books, or wood, it is surely gnawed and consumed. I should have thought myself pretty well off, had they only attacked the reeds of my hut; but they pierced through a trunk which stood on trestles a foot above the ground, and gnawed most of my book." ADANSON's Voyage to Guinea, 179—337.

N. B. Mr. ADANSON is certainly mistaken when he says, " They never make themselves known but by their covered ways, and is the only one who I have

" met

With these materials they completely line most of the roads leading from their nests into the various parts of the country, and travel out and home with the utmost security in all kinds of weather. If they meet a rock or any other obstruction, they will make their way upon the surface; and for that purpose erect a covered way or arch, still of the same materials, continuing it with many windings and ramifications through large groves; having, where it is possible, subterranean pipes running parallel with them, into which they sink and save themselves, if their galleries above ground are destroyed by any violence, or the tread of men or animals alarms them. When one chances by accident to enter any solitary grove, where the ground is pretty well covered with their arched galleries, they give the alarm by loud hislings, which we hear distinctly at every step we make; soon after which we may examine their galleries in vain for the insects, but find little holes, just large enough for them, by which they have made their escape into their subterraneous roads. These galleries are large enough for them to pass and repass so as to prevent any stoppages (though there are always numerous passengers) and shelter them equally from light and

"met with who has been attacked while living by the *white Ants*." I have some doubt, that, although the approaches of the *Termites* were carried up to his bed, the bites he received were from *real Ants*, of which there are some scarce visible which are very numerous and produce great pain; whereas the bite of the *Termes* lets out much blood, and shews not the least symptom of venom. See DU TERTRE's Antilles, vol. II. p. 344. and Descript. de l'Afrique, par LABAT, tom. III. p. 298.

(32) See SLOANE, LIGON, LINNÆUS (*Termes Fatalis*), FORSKAL (*Termes Arda*), and the various voyages to Africa and both Indies.

air, as well as from their enemies, of which the ants, being the most numerous, are the most formidable.

The *Termites*, except their heads, are exceeding soft, and covered with a very thin and delicate skin; being blind, they are no match on open ground for the ants, who can see, and are all of them covered with a strong horny shell not easily pierced, and are of dispositions bold, active, and rapacious. Whenever the Termites are dislodged from their covered ways, the various species of the former, who probably are as numerous above ground as the latter are in their subterraneous passages, instantly seize and drag them away to their nests, to feed the young brood (33) (34) (35). The Termites are therefore exceeding solicitous

(33) Sir HANS SLOANE was certainly mistaken in his account of the Wood Ants; it is utterly improbable that they should go into the nests of the red Ants and kill them. It is most probable, the error has arisen from Sir HANS's having confounded the two genera of insects the *Formica* and *Termes* together, which made him never speak of them with precision. The reverse of his account is most likely, which is, that the *Formicæ* will follow their plunder into the nests of the *Termites* and destroy them; for the latter always keep within their nests or covered ways, avoiding all communications with other insects and animals, and never meddling with them but when dead; whereas the *Formicæ* ramble about every where, and enter every cranny and hole that is large enough, and attack not only insects and reptiles but even large animals. See SLOANE'S Voyage to Jamaica, vol. II. p. 221, 222. tab. 238. *Hist. de l'Academie Royale des Sciences*, 1701, p. 16. *Fourmis de Vifite*.

(34) LIGON mentions another sort of *Ants*, and describes the galleries of the *Termites*. LIGON'S Barbadoes, p. 64, 65.

(35) MERIAN says, the *Ants* make nests above eight feet high, by which I apprehend she means the nests of the *Termites*; but in speaking of the manners of the insects she certainly means some species of the *Formica*. Those which are described as stripping the trees are a species called, in Tobago, *Para-sol-Ants*, because they cut out of the leaves of certain trees and plants pieces almost circular,

and

solicitous about the preserving their covered ways in good repair; and if you demolish one of them, for a few inches in length, it is wonderful how soon they rebuild it. At first in their hurry they get into the open part an inch or two, but stop so suddenly that it is very apparent they are surprized: for though some run straight on, and get under the arch as speedily as possible in the further part, most of them run as fast back, and very few will venture through that part of the track which is left uncovered. In a few minutes you will perceive them rebuilding the arch, and by the next morning they will have restored their gallery for three or four yards in length, if so much has been ruined; and upon opening it again will be found as numerous as ever, under it, passing both ways. If you continue to destroy it several times, they will at length seem to give up the point, and build another in a different direction; but, if the old one led to some favourite plunder, in a few days will rebuild it again; and, unless you destroy their nest, never totally abandon their gallery.

The *Termites arborum*, those which build in trees, frequently establish their nests within the roofs and other parts of houses, to which they do considerable damage, if not timely extirpated.

The large species are, however, not only much more destructive, but more difficult to be guarded against, since they make their approaches chiefly under ground, descending below the foundations of houses and stores at several feet from the surface, and rising again either in the floors, or entering at the

and are to be seen all the year round travelling from the plants along their road to the nest, with each one of these circular pieces of leaves in their jaws, which, from their shape and colour, give a very good idea of people walking with parasols (umbrellas). MERIAN, *Insectes de Surinam*, p. 18.

bottoms

bottoms of the posts, of which the sides of the buildings are composed, bore quite through them, following the course of the fibres to the top, or making lateral perforations and cavities here and there as they proceed.

While some are employed in gutting the posts, others ascend from them, entering a rafter or some other part of the roof. If they once find the thatch, which seems to be a favourite food, they soon bring up wet clay, and build their pipes or galleries through the roof in various directions, as long as it will support them; sometimes eating the palm-tree leaves and branches of which it is composed, and, perhaps (for variety seems very pleasing to them) the rattan or other running plant which is used as a cord to tye the various parts of the roof together, and that to the posts which support it: thus, with the assistance of the rats, who during the rainy season are apt to shelter themselves there, and to burrow through it, they very soon ruin the house by weakening the fastenings and exposing it to the wet. In the mean time the posts will be perforated in every direction as full of holes as that timber in the bottoms of ships which has been bored by the worms; the fibrous and knotty parts, which are the hardest, being left to the last<sup>(36)</sup>.

They

(36) The sea worms, so pernicious to our shipping, appear to have the same office allotted them in the waters which the Termites have on the land. They will appear, on a very little consideration, to be most important beings in the great chain of creation, and pleasing demonstrations of that infinitely wise and gracious Power which formed, and still preserves, the whole in such wonderful order and beauty: for if it was not for the rapacity of these and such animals, tropical rivers, and indeed the ocean itself, would be choked with the bodies of trees which are annually carried down by the rapid torrents, as many of them would last for ages, and probably be productive of evils, of which, happily,

They sometimes, in carrying on this business, find, I will not pretend to say how, that the post has some weight to support, and then if it is a convenient track to the roof, or is itself a kind of wood agreeable to them, they bring their mortar, and fill all or most of the cavities, leaving the necessary roads through it, and as fast as they take away the wood replace the vacancy with that material; which being worked together by them closer and more compactly than human strength or art could ram it, when the house is pulled to pieces, in order to examine if any of the posts are fit to be used again, those of the softer kinds are often found reduced almost to a shell, and all or a greater part transformed from wood to clay as solid and as hard as many kinds of free-stone used for building in England. It is much the same when the *Termites bellicosus* get into a chest or trunk containing cloaths and other things; if the weight

we cannot in the present harmonious state of things form any idea \*; whereas now being consumed by these animals, they are more easily broken in pieces by the waves; and the fragments which are not devoured become specifically lighter, and are consequently more readily and more effectually thrown on shore, where the sun, wind, insects, and various other instruments, speedily promote their entire dissolution, and restore the constituent particles to that

“ Mighty hand,

“ Which, ever busy, wheels the silent spheres ;  
 “ Works in the secret deep ; shoots, steaming, thence  
 “ The fair profusion that o'erpreads the spring :  
 “ Flings from the sun direct the flaming day ;  
 “ Feeds every creature ; hurls the tempest forth ;  
 “ And, as on earth this grateful change revolves,  
 “ With transport touches all the springs of life.”

THOMSON.

\* That wood will endure in water an amazing number of ages, is apparent from the oak stakes which were driven into the bed of the river Thames on the invasion of this island by *Julius Caesar*, one of which is to be seen in Sir ASHTON LEVER's Museum, and likewise from those bodies of trees which are daily found in the bogs and morasses of Great Britain and Ireland; which after a duration, the former of eighteen hundred, the latter of upwards of two thousand years, are found in a perfect state of preservation.

above

above is great, or they are afraid of Ants or other enemies, and have time, they carry their pipes through, and replace a great part with clay, running their galleries in various directions. The tree Termites, indeed, when they get within a box, often make a nest there, and being once in possession destroy it at their leisure. They did so to the pyramidal box which contained my compound microscope. It was of mahogany, and I had left it in the store of Governor CAMPBELL of Tobago, for a few months, while I made the tour of the Leeward Islands. On my return I found these insects had done much mischief in the store, and, among other things, had taken possession of the microscope, and eaten every thing about it except the glass or metal, and the board on which the pedestal is fixed, with the drawers under it, and the things inclosed. The cells were built all round the pedestal and the tube, and attached to it on every side. All the glasses which were covered with the wooden substance of their nests retained a cloud of a gummy nature upon them that was not easily got off, and the lacquer or burnish with which the brass work was covered was totally spoiled. Another party had taken a liking to the staves of a Madeira cask, and had let out almost a pipe of fine old wine. If the large species of Africa (*the Termites bellicosus*) had been so long in the uninterrupted possession of such a store, they would not have left twenty pounds weight of wood remaining of the whole building, and all that it contained<sup>(37)</sup>.

Thefe

(37) Captain PHILLIP of the navy, who was some time at the Brazils in the service of Portugal, gives me the following relation. " An engineer returned from surveying the country, left his trunk on a table: the next morning, not only all his cloaths were destroyed by *white Ants* or *Cutters*, but his papers also; and the latter in such a manner, that there was not a bit left of an inch square."

These insects are not less expeditious in destroying the shelves, wainscotting, and other fixtures of an house, than the house itself. They are for ever piercing and boring in all directions, and sometimes go out of the broadside of one post into that of another joining to it; but they prefer and always destroy the softer substances the first, and are particularly fond of pine and fir-boards, which they excavate and carry away with wonderful dispatch and astonishing cunning: for, except a shelf has something standing upon it, as a book, or any thing else which may tempt them, they will not perforate the surface, but artfully preserve it quite whole, and eat away all the inside, except a few fibres which barely keep the two sides connected together, so that a piece of an inch-board which appears solid to the eye will not weigh much more than two sheets of paste-board of equal dimensions, after these animals have been a little while in possession of it (38) (39) (40) (41). In short, the Termites are

so

" The black lead pencils were likewise so completely destroyed, that the smallest piece, even of the *black lead* could not be found. The cloaths were not entirely cut to pieces and carried away, but appeared as if moth-eaten, there being scarce a piece as large as a shilling that was free from small holes; and it was further remarkable, that some *silver coin*, which was in the trunk, had a number of black specks on it, caused by something so corrosive that they could not easily be rubbed off even with sand." Queen's-square, Wednesday, Jan.

17, 1781.

(38) " The white Ants are transparent as glass, and bite so forcibly, that in the space of one night alone they can eat their way through a thick wooden chest of goods, and make it as full of holes, as if it had been shot through with hail-shot." BOSMAN's Guinea, p. 276, 7. 493.

(39) MOORE's Travels, p. 221.

(40) Voyage de LABAT aux Isles, tom. II. p. 331.

(41) " The wood Ants are the most pernicious of all others, being so very destructive to timber of most sorts, that, if not prevented, they will in a few years

so insidious in their attacks, that we cannot be too much on our guard against them : they will sometimes begin and raise their works, especially in new houses, through the floor<sup>(42)</sup>. If you destroy the work so begun, and make a fire upon the spot, the next night they will attempt to rise through another part ; and, if they happen to emerge under a chest or trunk early in the night, will pierce the bottom, and destroy or spoil every thing in it before the morning<sup>(43)</sup>. On these accounts we are careful to set all our chests and boxes upon stones or bricks, so as to leave the bottoms of such furniture some inches above the ground ; which not only prevents these insects finding them out so readily, but preserves the bottoms from a corrosive damp which would strike from the earth through, and rot every thing therein : a vast deal of vermin also would harbour under, such as Cock-roaches, Centipedes, Millepedes, Scorpions, Ants, and various other noisome insects.

When the Termites attack trees and branches in the open air, they sometimes vary their manner of doing it. If a stake in a hedge has not taken root and vegetated, it becomes their business to destroy it. If it has a good sound bark round it, they

" years time destroy the whole roof of an house, especially if it be of soft timber. — They have likewise caused great losses to shop-keepers, by boring " through whole bales of linnen as well as woolen cloths. HUGHES's Barbadoes,  
P. 93.

(42) The floors are generally made of the stone or clay taken from the hills raised by these insects, which, being moistened with water, and mixed by treading, is beaten level, smooth, and compact, with their feet and a kind of hand-bat or beetle.

(43) " One night, in a few hours, they pierced one foot of the table, and " (having in that manner ascended) carried their arch across it, and then " down through the middle of the other foot into the floor, as good luck would. " have it, without doing any damage to the papers left there." KEMPFER Hist. Japan, vol. II. p. 127.

will

will enter at the bottom, and eat all but the bark, which will remain, and exhibit the appearance of a solid stick (which some vagrant colony of Ants or other insects often shelter in till the winds disperse it); but if they cannot trust the bark, they cover the whole stick with their mortar, and it then looks as if it had been dipped into thick mud that had been dried on. Under this covering they work, leaving no more of the stick and bark than is barely sufficient to support it, and frequently not the smallest particle, so that upon a very small tap with your walking stick, the whole stake, though apparently as thick as your arm, and five or six feet long, loses its form, and disappearing like a shadow falls in small fragments at your feet. They generally enter the body of a large tree which has fallen through age or been thrown down by violence, on the side next the ground, and eat away at their leisure within the bark, without giving themselves the trouble either to cover it on the outside, or to replace the wood which they have removed from within, being somehow sensible that there is no necessity for it. These excavated trees have deceived me two or three times in running: for, attempting to step two or three feet high, I might as well have attempted to step upon a cloud, and have come down with such unexpected violence, that, besides shaking my teeth and bones almost to dislocation, I have been precipitated, head foremost, among the neighbouring trees and bushes. Sometimes, though seldom, the animals are known to attack living trees; but not, I apprehend, before symptoms of mortification have appeared at the roots, since it is evident, as is before observed, that these insects are intended in the order of nature to hasten the dissolution of such trees and vegetables as have arrived at their greatest maturity and per-

fection, and which would, by a tedious decay, serve only to encumber the face of the earth. This purpose they answer so effectually, that nothing perishable escapes them, and it is almost impossible to leave any thing penetrable upon the ground a long time in safety; for the odds are, that, put it where you will abroad, they will find it out before the following morning, and its destruction follows very soon of course. In consequence of this disposition, the woods never remain long encumbered with the fallen trunks of trees or their branches; and thus it is, as I have before observed, the total destruction of deserted towns is so effectually completed, that in two or three years a thick wood fills the space; and, unless *iron-wood* posts have been made use of, not the least vestige of an house is to be discovered.

The first object of admiration which strikes one upon opening their hills is the behaviour of the soldiers. If you make a breach in a flight part of the building, and do it quickly with a strong hoe or pick-axe, in the space of a few seconds a soldier will run out, and walk about the breach, as if to see whether the enemy is gone, or to examine what is the cause of the attack. He will sometimes go in again, as if to give the alarm: but most frequently, in a short time, is followed by two or three others, who run as fast as they can, straggling after one another, and are soon followed by a large body who rush out as fast as the breach will permit them, and so they proceed, the number increasing, as long as any one continues battering their building<sup>(44)</sup>. It is not easy to describe the rage and fury

(44) " They throw up little hills of seven or eight feet high, so very full of holes that they rather seem like honey-combs than burrows. These Ant hills are of a very small circumference in proportion to their height, being sharp at top, so that to judge by the looks of them one would think the wind could blow them down;

fury they shew. In their hurry they frequently miss their hold, and tumble down the sides of the hill, but recover themselves as quickly as possible; and, being blind, bite every thing they run against, and thus make a crackling noise, while some of them beat repeatedly with their forceps upon the building, and make a small vibrating noise, something shriller and quicker than the ticking of a watch: I could distinguish this noise at three or four feet distance, and it continued for a minute at a time, with short intervals. While the attack proceeds they are in the most violent bustle and agitation. If they get hold of any one, they will in an instant let out blood enough to weigh against their whole body; and if it is the leg they wound, you will see the stain upon the stocking extend an inch in width. They make their hooked jaws meet at the first stroke, and never quit their hold, but suffer themselves to be pulled away leg by leg, and piece after piece, without the least attempt to escape. On the other hand, keep out of their way, and give them no interruption, and they will in less than half an hour retire into the nest, as if they supposed the wonderful monster that damaged their castle to be gone beyond their reach. Before they are all got in you will see the labourers in motion, and hastening in various directions toward the breach: every one with a burthen of mortar in his mouth ready tempered. This they stick upon the breach as fast as they come up, and do it with so much dispatch and facility, that although there are thousands, and I may say millions, of them, they never stop or

“ down. I one day attempted to knock off the top of one of them with my cane,  
 “ but the stroke had no other effect than to bring some thousands of the animals  
 “ out of doors, to see what was the matter: upon which I took to my heels and  
 “ ran away as fast as I could.” *SMITH's Voyage to Guinea.*

embarrass

embarrass one another ; and you are most agreeably deceived when, after an apparent scene of hurry and confusion, a regular wall arises, gradually filling up the chasm. While they are thus employed, almost all the soldiers are retired quite out of sight, except here and there one, who saunters about among six hundred or a thousand of the labourers, but never touches the mortar either to lift or carry it ; one, in particular, places himself close to the wall they are building. This soldier will turn himself leisurely on all sides, and every now and then, at intervals of a minute or two, lift up his head, and with his forceps beat upon the building, and make the vibrating noise before mentioned ; on which immediately a loud hiss, which appears to come from all the labourers, issues from within side the dome and all the subterraneous caverns and passages : that it does come from the labourers is very evident, for you will see them all hasten at every such signal, redouble their pace, and work as fast again.

As the most interesting experiments become dull by repetition or continuance, so the uniformity with which this business is carried on, though so very wonderful, at last satiates the mind. A renewal of the attack, however, instantly changes the scene, and gratifies our curiosity still more. At every stroke we hear a loud hiss ; and on the first the labourers run into the many pipes and galleries with which the building is perforated, which they do so quickly that they seem to vanish, for in a few seconds all are gone, and the soldiers rush out as numerous and as vindictive as before (45). On finding no enemy they return again leisurely into

(45) By the soldiers being so ready to run out upon the repetition of the attack, it appears, that they but just withdraw out of sight, to leave room for the labourers to proceed without interruption in repairing the breach, and in this

into the hill, and very soon after the labourers appear loaded as at first, as active and as sedulous, with soldiers here and there among them, who act just in the same manner, one or other of them giving the signal to hasten the business. Thus the pleasure of seeing them come out to fight or to work alternately may be obtained as often as curiosity excites or time permits: and it will certainly be found, that the one order never attempts to fight, or the other to work, let the emergency be ever so great.

We meet vast obstacles in examining the interior parts of these tumuli. In the first place, the works, for instance, the apartments which surround the royal chamber and the nurseries, and indeed the whole internal fabric, are moist, and consequently the clay is very brittle: they have also so close a connexion, that they can only be seen as it were by piece-meal; for having a kind of geometrical dependance or abutment against each other, the breaking of one arch pulls down two or three. To these obstacles must be added the obstinacy of the soldiers, who fight to the very last, disputing every inch of ground so well as often to drive away the negroes who are without shoes, and make white people bleed plentifully through their stockings. Neither can we let a building stand so as to get a view of the interior parts without interruption, for while the soldiers are defending the

instance they shew more good sense than the bulk of mankind, for, in case of a conflagration in a city, the number of people who assemble to stare is much greater than of those who come to assist, and the former always interrupt and hinder the latter in their efforts. The sudden retreat of the labourers, in case of an alarm, is also a wonderful instance of good order and discipline, seldom seen in populous cities, where we frequently find helpless people, women, and children, without any ill intention, intermixing in violent tumults and dangerous riots.

out-works, the labourers keep barricadoing all the way against us, stopping up the different galleries and passages which lead to the various apartments, particularly the royal chamber, all the entrances to which they fill up so artfully as not to let it be distinguishable while it remains moist; and externally it has no other appearance than that of a shapeless lump of clay<sup>(46)</sup>. It is, however, easily found from its situation with respect to the other parts of the building, and by the crowds of labourers and soldiers which surround it, who shew their loyalty and fidelity by dying under its walls. The royal chamber in a large nest is capacious enough to hold many hundreds of the attendants, besides the royal pair, and you always find it as full of them as it can hold. These faithful subjects never abandon their charge even in the last distress; for whenever I took out the royal chamber, and, as I often did, preserved it for some time in a large glass bowl, all the attendants continued running in one direction round the king and queen with the utmost solicitude, some of them stopping on every circuit at the head of the latter, as if to give her something. When they came to the extremity of the abdomen, they took the eggs from her, and carried them away, and piled them carefully together in some part of the chamber, or in the bowl under, or behind any pieces of broken clay which lay most convenient for the purpose.

(46) In tab. VIII. fig. 2. and 4. the entrances of the royal chamber, now exhibited, are represented open. They were all shut by the labourers before I had got to it, and were opened since I arrived in England. Two or three of them, however, are not quite open in the chamber itself, and that next the breach at A, and marked with a cross  $\oplus$ , is still left shut, as a specimen of the manner in which they do it. I have also more royal chambers and various specimens of the interior buildings, with several galleries and passages, shut up while we were attacking the nest.

Some of these little unhappy creatures would ramble from the chamber, as if to explore the cause of such a horrid ruin and catastrophe to their immense building, as it must appear to them; and, after fruitless endeavours to get over the side of the bowl, return and mix with the croud that continue running round their common parents to the last (tab. VIII. fig. 4. b.). Others, placing themselves along her side, get hold of the queen's vast matrix with their jaws, and pull with all their strength so as visibly to lift up the part which they fix at; but, as I never saw any effect from these attempts, I never could determine whether this pulling was with an intention to remove her body, or to stimulate her to move herself, or for any other purpose; but, after many ineffectual tugs, they would desist and join in the croud running round, or assist some of those who are cutting off clay from the external parts of the chamber or some of the fragments and moistening it with the juices of their bodies, to begin to work a thin arched shell over the body of the queen, as if to exclude the air, or to hide her from the observation of some enemy. These, if not interrupted, before the next morning, completely cover her, leaving room enough within for great numbers to run about her.

I do not mention the king in this case, because he is very small in proportion to the queen, not being bigger than thirty of the labourers, so that he generally conceals himself under one side of the abdomen, except when he goes up to the queen's head, which he does now and then, but not so frequently as the rest.

If in your attack on the hill you stop short of the royal chamber, and cut down about half of the building, and leave open some thousands of galleries and chambers, they will all be shut up with thin sheets of clay before the next morning. If even the whole is pulled down, and the different buildings are thrown

in a confused heap of ruins, provided the king and queen are not destroyed or taken away, every interstice between the ruins, at which either cold or wet can possibly enter, will be so covered as to exclude both, and, if the animals are left undisturbed, in about a year they will raise the building to near its pristine size and grandeur.

The marching Termites are not less curious in their order, as far as I have had an opportunity of observing them, than those described before. This species seems much scarcer and larger than the *Termes bellicosus*. I could get no information relative to them from the black people, from which I conjecture they are little known to them: my seeing them was very accidental. One day, having made an excursion with my gun up the river Camerankoes, on my return through the thick forest, whilst I was sauntering very silently in hopes of finding some sport, on a sudden I heard a loud hiss, which, on account of the many serpents in those countries, is a most alarming sound. The next step caused a repetition of the noise, which I soon recognized, and was rather surprised seeing no covered ways or hills. The noise, however, led me a few paces from the path, where, to my great astonishment and pleasure, I saw an army of Termites coming out of a hole in the ground, which could not be above four or five inches wide. They came out in vast numbers, moving forward as fast seemingly as it was possible for them to march. In less than a yard from this place they divided into two streams or columns, composed chiefly of the first order, which I call labourers, twelve or fifteen a-breast, and crowded as close after one another as sheep in a drove, going straight forward without deviating to the right or left. Among these, here and there, one of the soldiers was to be seen, trudging along with them, in the same manner, neither stopping

or turning ; and as he carried his enormous large head with apparent difficulty, he put me in mind of a very large ox amidst a flock of sheep. While these were bustling along, a great many soldiers were to be seen spread about on both sides of the two lines of march, some a foot or two distant, standing still or sauntering about as if upon the look out least some enemy should suddenly come upon the labourers. But the most extraordinary part of this march was the conduct of some others of the soldiers, who having mounted the plants which grow thinly here and there in the thick shade, had placed themselves upon the points of the leaves, which were elevated ten or fifteen inches above the ground, and hung over the army marching below. Every now and then one or other of them beat with his forceps upon the leaf, and made the same sort of ticking noise which I had so frequently observed to be made by the soldier who acts the part of a surveyor or super-intendant when the labourers are at work repairing a breach made in one of the common hills of the *Termites bellicosæ*. This signal among the marching white Ants produced a similar effect ; for, whenever it was made, the whole army returned a hiss, and obeyed the signal by increasing their pace with the utmost hurry. The soldiers who had mounted aloft, and gave these signals, sat quite still during the intervals (except making now and then a slight turn of the head) and seemed as solicitous to keep their posts as regular centinels. The two columns of the army joined into one about twelve or fifteen paces from their separation, having in no part been above three yards asunder, and then descended into the earth by two or three holes. They continued marching by me for above an hour that I stood admiring them, and seemed neither to increase or diminish their numbers, the soldiers only excepted, who quitted

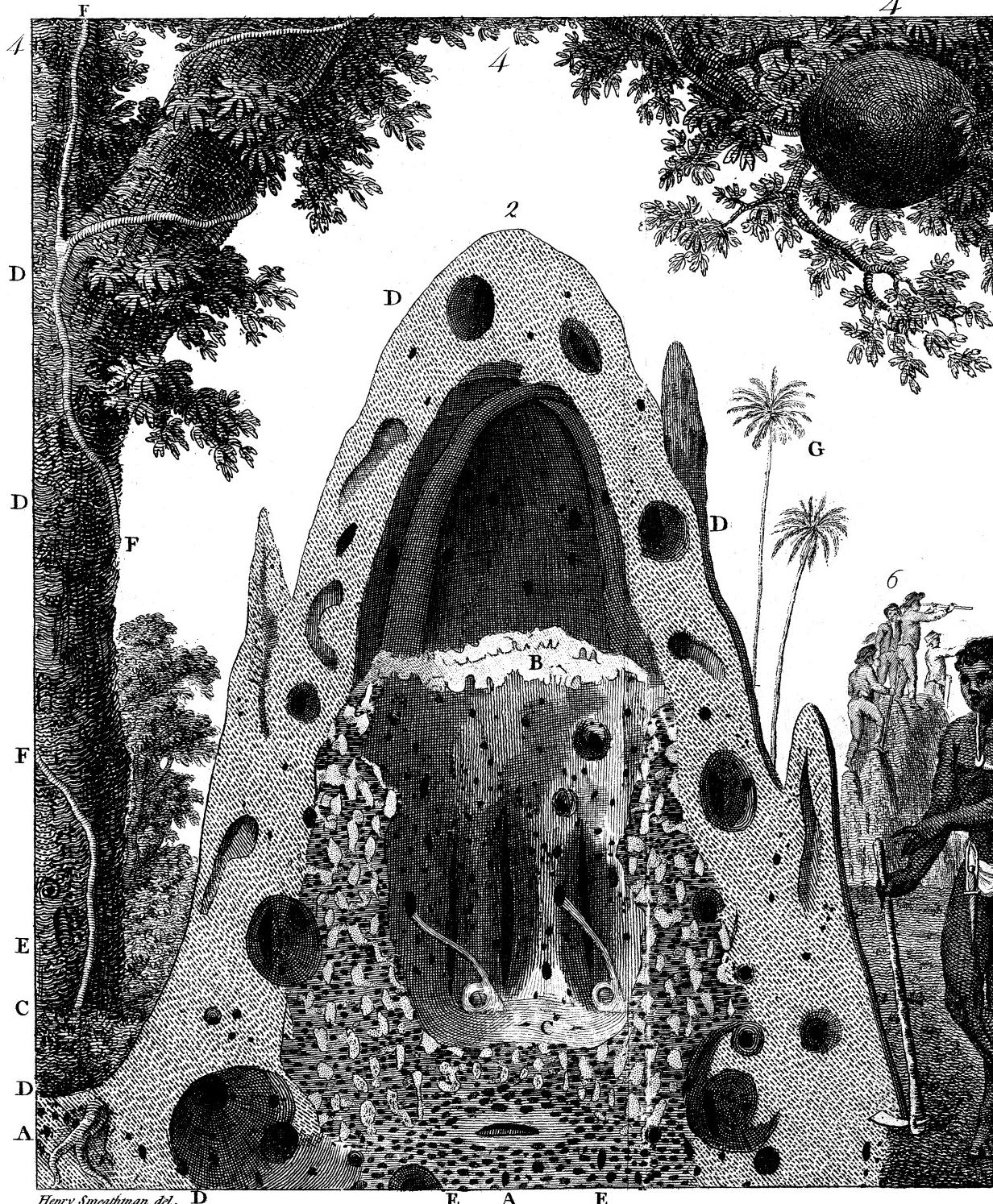
quitted the line of march, themselves at different distances on each side of the two columns ; for they appeared much more numerous before I quitted the spot. Not expecting to see any change in their march, and being pinched for time, the tide being nearly up, and our departure fixed at high water, I quitted the scene with some regret, as the observation of a day or two might have afforded me the opportunity of exploring the reason and necessity of their marching with such expedition, as well as of discovering their chief settlement, which is probably built in the same manner as the large hills before described. If so, it may be larger and more curious, as these insects were at least one-third larger than the other species, and consequently their buildings must be more wonderful if possible : thus much is certain, there must be some fixed place for their king and queen, and the young ones. Of these species I have not seen the perfect insect.

The œconomy of nature is wonderfully displayed in a comparative observation on the different species who are calculated to live under ground until they have wings ; and this species which marches in great bodies in open day. The former, in the two first states, that is, of labourers and soldiers, have no eyes that I could ever discover ; but when they arrive at the winged or perfect state in which they are to appear abroad, though only for a few hours, and that chiefly in the night, they are furnished with two conspicuous and fine eyes : so the *Termes viarum*, or marching Bugga Bugs, being intended to walk in the open air and light, are even in the first state furnished with eyes proportionably as fine as those which are given to the winged or perfect insects of the other species.

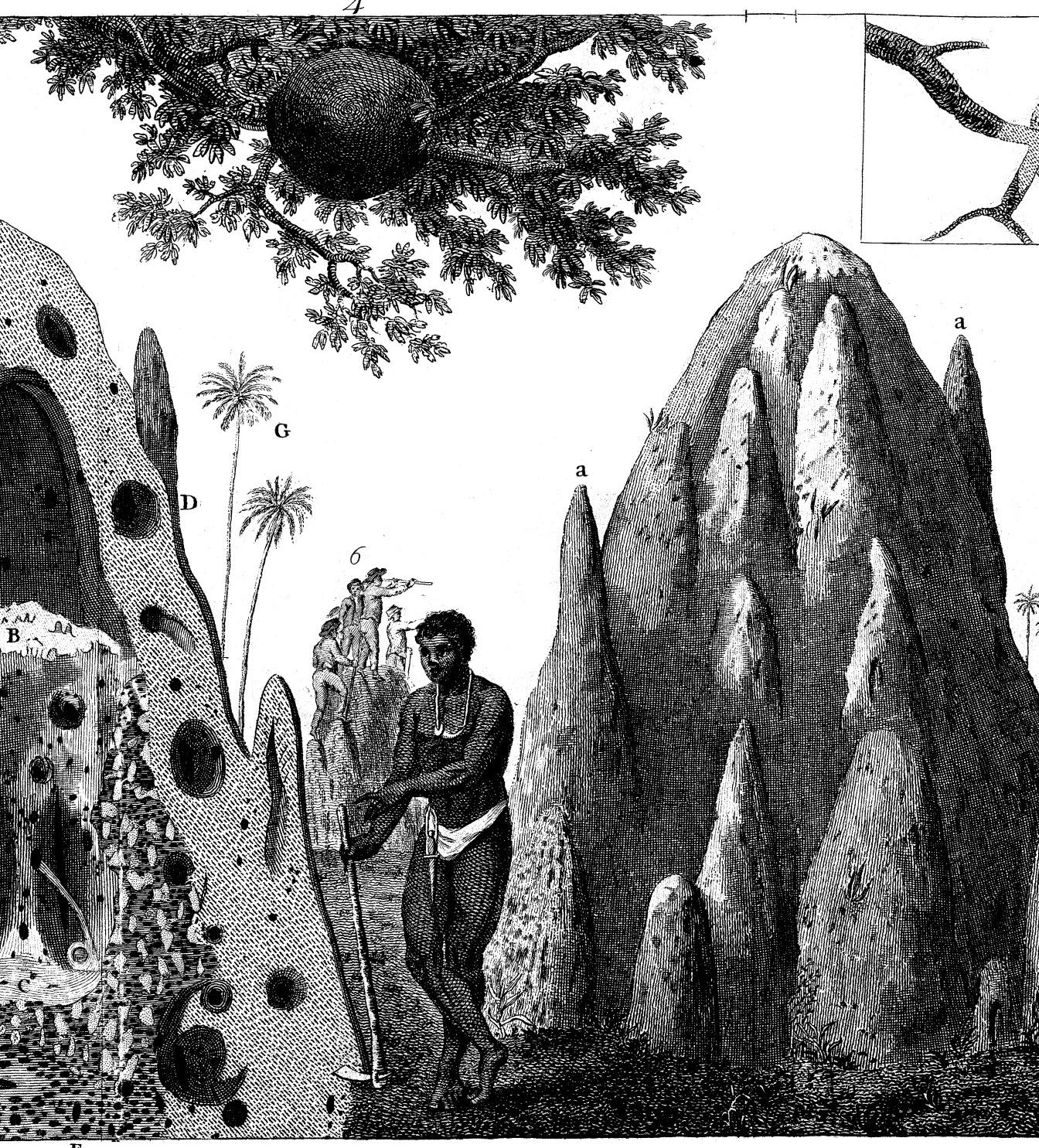
I am afraid of encumbering your time, which leads me to drop the subject for the present; but, as my materials are not exhausted, if these sheets meet with your approbation, it will encourage me to give some further particulars, with observations and reflections, at a future period.

I have the honour to be, &c.

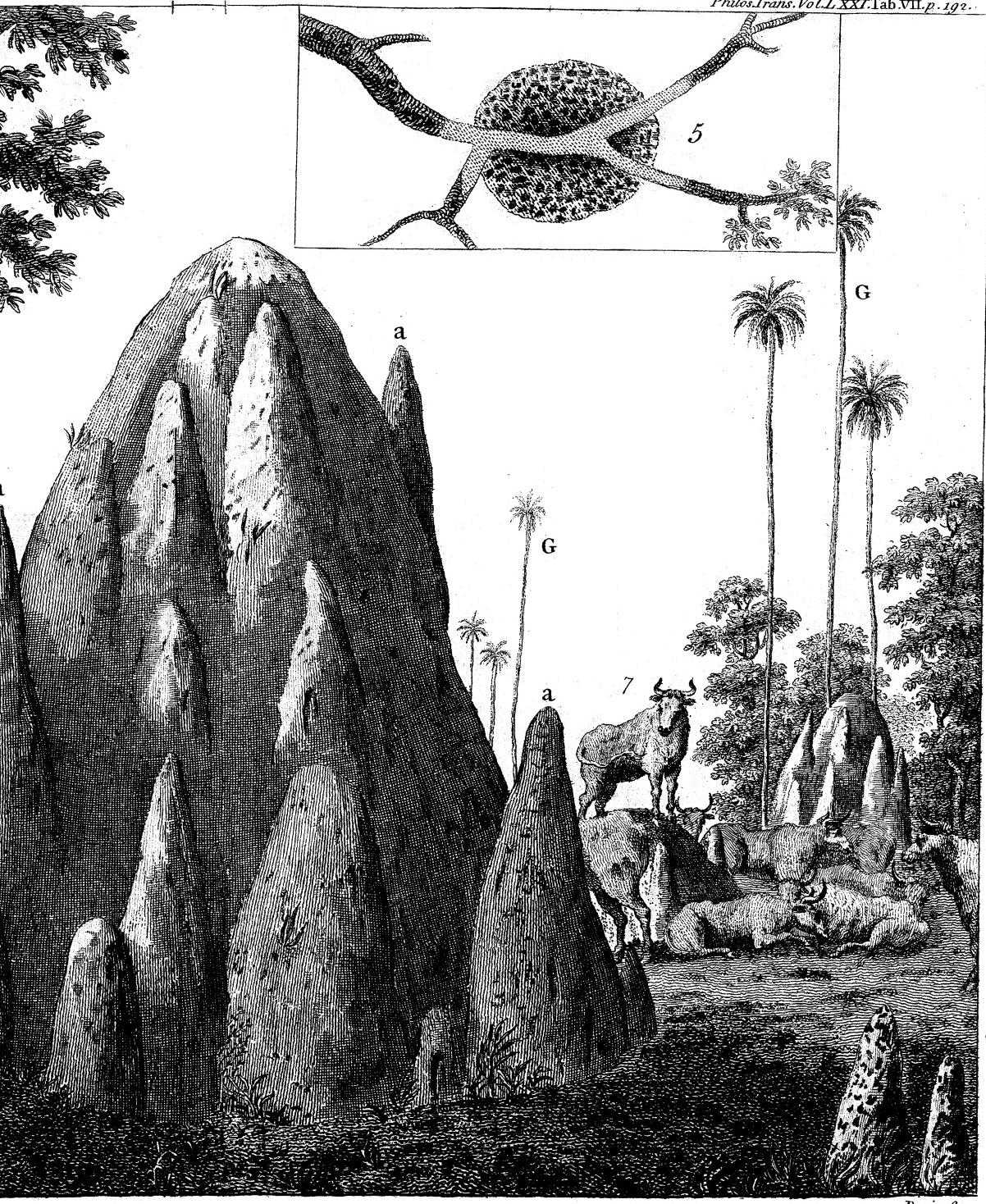


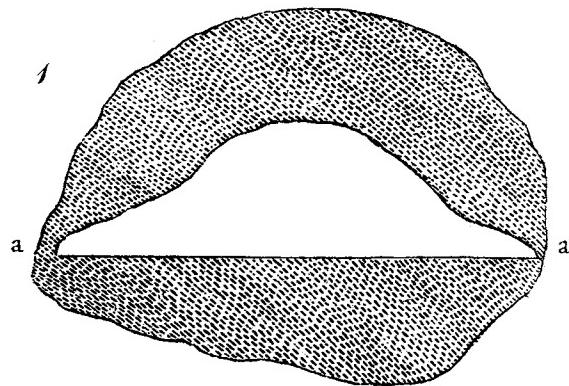


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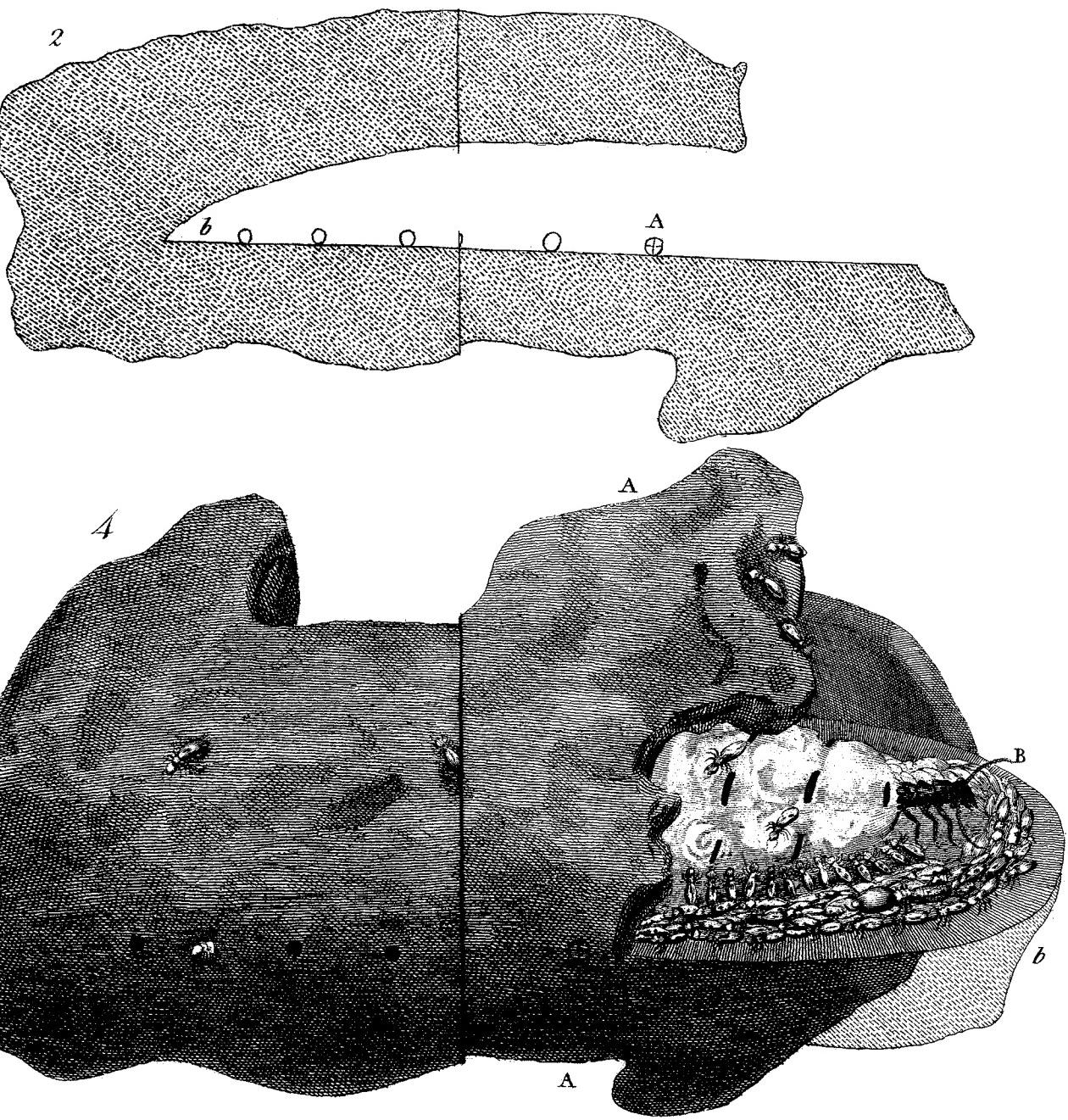


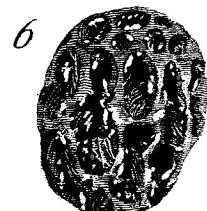
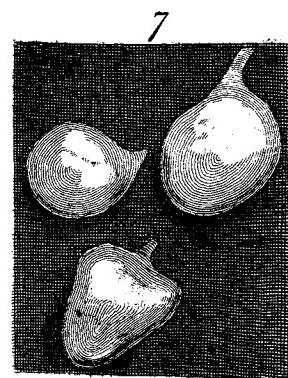
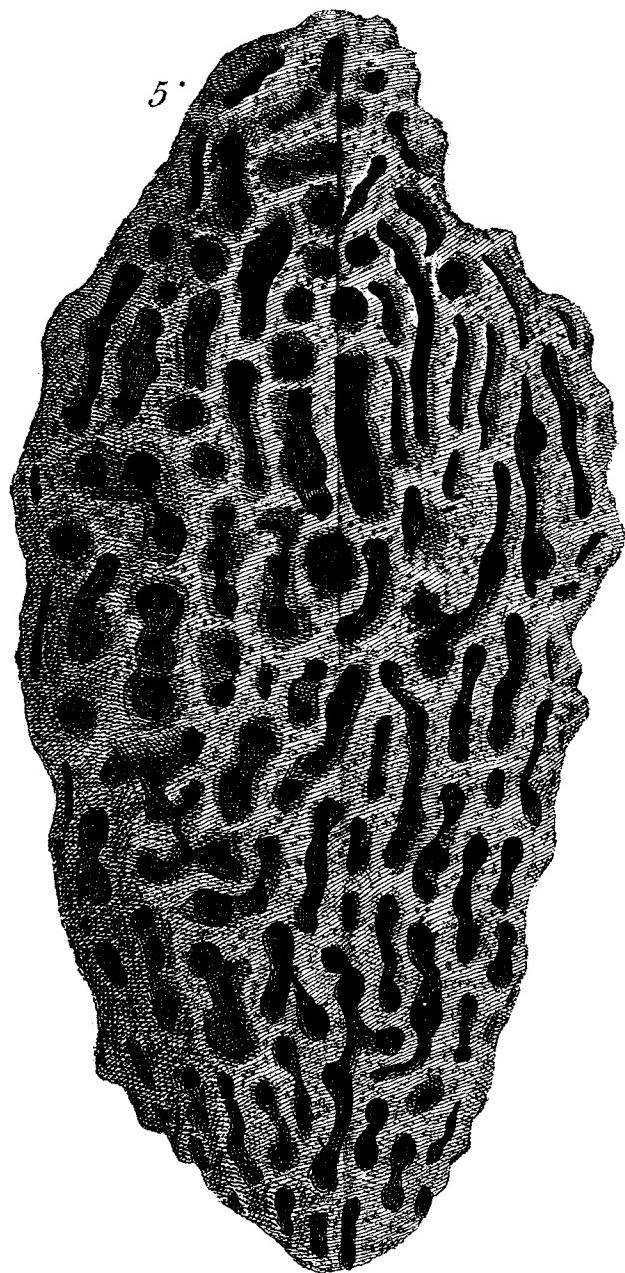
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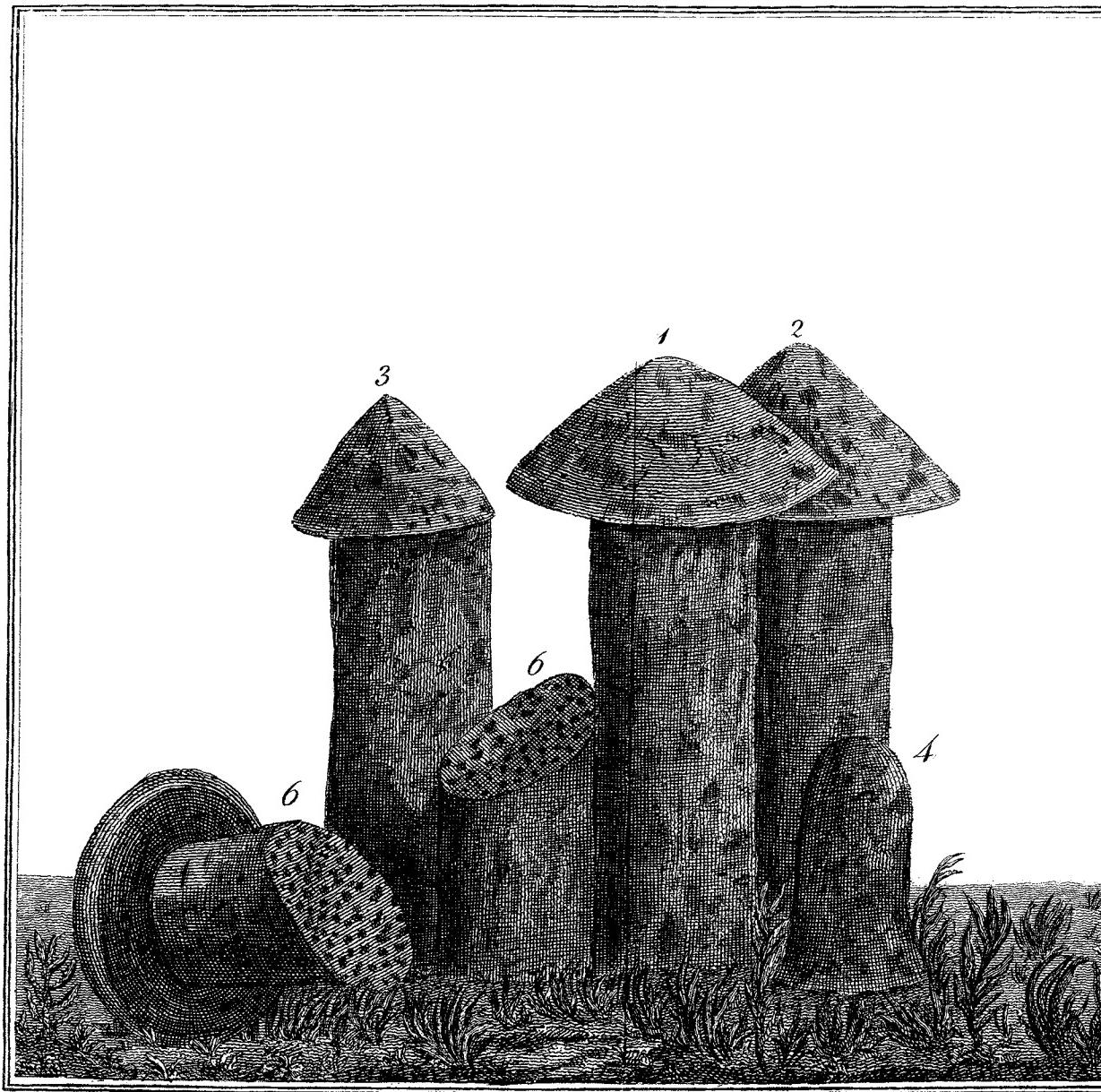




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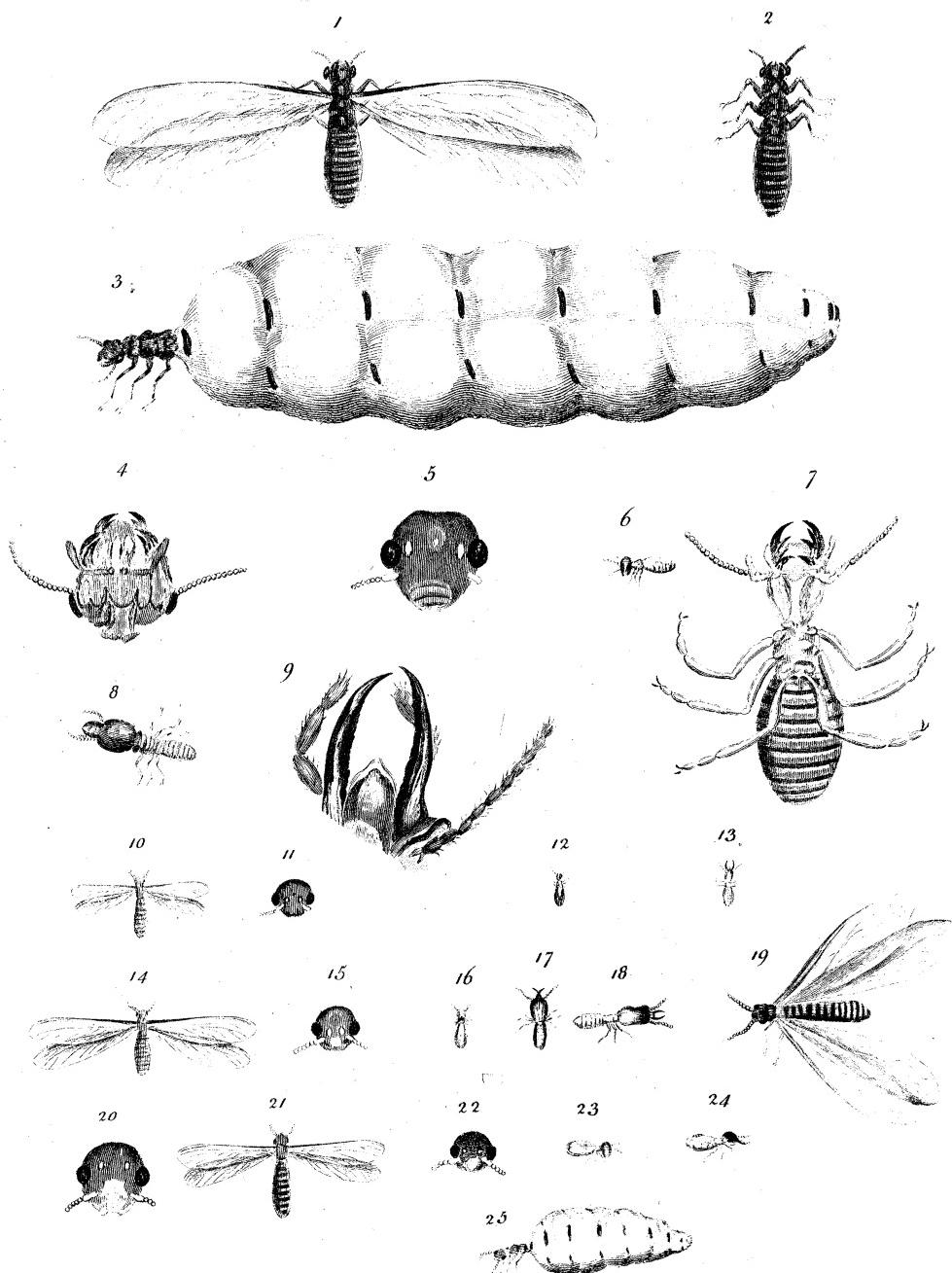






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## Explanation of the plates to Mr. SMEATHMAN's Account of the Termites of Africa, &c.

T A B. VII. fig. 1. The hill-nest raised by the Termites bellicos, described page 148.

aaa. Turrets by which their hills are raised and enlarged, p. 150.

Fig. 2. A section of fig. 1. as it would appear on being cut down through the middle from the top a foot lower than the surface of the ground, p. 154.

AA. An horizontal line from A on the left, and a perpendicular line from A at the bottom, will intersect each other at the royal chamber, p. 154.

The darker shades near it are the empty apartments and passages, which it seems are left so for the attendants on the king and queen, who, when old, may require near one hundred thousand to wait on them every day.

The parts which are the least shaded and dotted are the nurseries, surrounded, like the royal chamber by empty passages on all sides for the more easy access to them with the eggs from the queen, the provision for the young, &c. N.B. The magazines of provisions are situated without any seeming order among the vacant passages which surround the nurseries.

b. The top of the interior building, which often seems, from the arches carrying upward, to be adorned on the sides with pinnacles, p. 156.

c. The floor of the area or nave, p. 156.

DDD. The large galleries which ascend from under all the buildings spirally to the top, p. 156.

EE. The bridges, p. 158.

Fig. 3. The first appearance of an hill-nest by two turrets, p. 150.

Fig. 4. A tree, with the nest of the Termites arborum, and their covered way, p. 161.

FFFF. Covered ways of the Termites arborum, p. 173.

Fig. 5. A section of the nest of the Termites arborum.

Fig. 6. A nest of the Termites bellicos, with Europeans on it, seemingly observing a vessel at sea, p. 151.

Fig. 7. A bull standing sentinel upon one of these nests, while the rest of the herd is ruminating below, p. 151.

GGG. The African palm-trees, from the nuts of which is made the Oleum Palmae.

Tab. VIII. fig. 1. A transverse section of a royal chamber, p. 151.

aa. The thin sides in which the entrances are made, p. 152.

Fig. 2. A longitudinal section of a royal chamber, p. 151.

b. The entrances, p. 187.

A. The door shut up, as left by the labourers, p. 187.

Fig. 3. A royal chamber fore-shortened.

Fig. 4. The same royal chamber represented as just opened, and discovering (B) the queen, and her attendants running round her, p. 188.

bb. A line drawn from b to b will run along the range of doors or entrances, p. 187.

AAA. A line run from A to AA will cross the door, which remains closed as it was found. The rest are represented as they appear since the mortar, with

with which they were stopped up, has been in part or wholly picked out with a small instrument, p. 187.

Fig. 5. A nursery, p. 153.

Fig. 6. A little nursery, with the eggs, the young ones, the mushrooms, mouldinefs, &c. as just taken from the hill, p. 153.

Fig. 7. The mushrooms magnified by a strong lens, p. 154.

Tab. IX. fig. 1. and 2. The turret nests, with roofs of the *Termes mordax* and a *Termes atrox* as finished, p. 159.

Fig. 3. A turret, with the roof beg. n.

Fig. 4. A turret, raised only about half its height.

Fig. 5. A turret, building upon one which had been thrown down, p. 160.

Fig. 6. 6. A turret, broken in two.

Tab. X. fig. 1. A *Termes bellicosus*, p. 141. numb. 1. and p. 165.

Fig. 2. A KING. N. B. A king never alters his form after he loses his wings, neither does he apparently increase in bulk.

Fig. 3. A QUEEN, p. 170.

Fig. 4. The head of a perfect insect magnified.

Fig. 5. A face, with stemmata magnified, p. 141. numb. 1.

Fig. 6. A labourer, p. 163.

Fig. 7. A labourer magnified.

Fig. 8. A soldier, p. 164.

Fig. 9. A soldier's forceps and part of his head magnified, p. 164.

Fig. 10. The *Termes mordax*, p. 141. numb. 2. and p. 161.

Fig. 11. The face with the stemmata magnified, p. 141. numb. 2.

Fig. 12. A labourer.

Fig. 13. A soldier.

Fig. 14. The *Termes atrox*, p. 141. numb. 3. and p. 160.

Fig. 15. The face and stemmata magnified, p. 141. numb. 3.

Fig. 16. A labourer.

Fig. 17. A soldier.

Fig. 18. Idem.

Fig. 19. The *Termes destructor*, p. 141. numb. 4.

Fig. 20. The face and stemmata magnified, p. 141. numb. 4.

Fig. 21. The *Termes arborum*, p. 141. numb. 5. and p. 162.

Fig. 22. The face and stemmata magnified, p. 141. numb. 5.

Fig. 23. A labourer.

Fig. 24. A soldier.

Fig. 25. A QUEEN, p. 172.

N. B. In the figures 5. 11. 15. 20. and 21. the two white spots between the edges are the stemmata.

